MERGING METACOGNITIVE TOOLS FOR USE IN HIGHER EDUCATION TO FACILITATE MEANINGFUL LEARNING

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ABSTRACT

MERGING METACOGNITIVE TOOLS FOR USE IN HIGHER EDUCATION TO FACILITATE MEANINGFUL LEARNING

The current trend towards student-centred teaching and learning is bringing about a change in emphasis in Higher Education: a shift from promoting effective teaching towards developing an understanding of how students learn. Prevalent literature calls for more emphasis on the students' learning process through increased metacognition and critical reflection. This research revolves around the premise that learning takes place through the interaction of cognition (thinking), affectation (feeling) and conation (doing). Consequently, this study presents a model of teaching and learning in Higher Education through the integrated use of metacognitive tools, namely, Vee Heuristics and Concept Mapping along with an awareness of how students prefer to learn. This research suggests that when metacognitive tools are merged, students are empowered to embark upon a meta-learning journey which eventually leads to critical reflection and meaningful learning. In the Action Research carried out in the first phase, University students' work products, from the University of Malta, are used to trace the effect of a learner's mental operations on the learner's use of Vee Heuristics and Concept Mapping as the learner embeds and retrieves new and scaffolded knowledge. The analysis of data reveals the powerful effect which this combination of learning tools yielded on student achievement. The model presented yielded successful meaningful learning; however, one cannot assume that the same results will be produced if this model is used by other teachers. This reflection led to an emergent multilevel mixed method design in the second phase where the role of the teacher was highlighted to illustrate that teachers must see the purpose and value of the tools they are using. The teaching and learning process becomes most effective when teachers plan intentional approaches in response to how students are learning. Action research promotes a cyclical process and I am coming to a personal understanding that the tools and strategies did help me to create a meaningful learning environment which adequately responds to the 'learning-how-to-learn' concept. However, at the heart of quality teaching was my continuous reflective approach about the learning process and my own practice. I started this research by fallaciously assuming that focusing solely on the learner would bring about meaningful learning. However, the research has demonstrated that both students and lecturers are equally important and they should be seen as partners in achieving the intended learning outcome.

KEYWORDS

MEANINGFUL LEARNING – CONCEPT MAPPING – VEE HEURISTICS – CRITICAL REFLECTION – META LEARNING – HIGHER EDUCATION

To Kay, Keith and Angele who inspired my work and around whom my life revolves.

Alla mia dolce metà, a chi devo quella che sono diventata oggi.

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CHAPTER 1

INTRODUCTION

1.1 Purpose, significance and objectives of the research

We are living in a world, which is changing relentlessly at a breath-taking rate. In order to address these rapid changes, Malta is at the moment going through a wide-ranging reform in education. Robert M. Smith (1982:47), one of the first advocates of the ‘learning-how-to-learn’ concept, defines education as “the organised, systematic effort to foster learning, to establish the conditions, and to provide the activities through which learning can occur”. At the heart of the ‘learning-how-to-learn’ concept is the achievement of learner autonomy, where students take the responsibility for their own learning therefore setting the platform for lifelong learning. Currently, Malta is calling for a paradigm shift from a situation where teachers are disseminators of information and students are passive recipients to a scenario where teachers facilitate and empower all students to become active lifelong learners by equipping them with the necessary tools to embark upon a meta-learning journey leading to success (Ministry for Education & Employment, 2014a). We are, however, facing a huge dilemma; a dilemma noted by Fullan (1993b:3):

> On the one hand, schools are expected to engage in continuous renewal, and change expectations are constantly swirling around them. On the other hand, the way teachers are trained, the way schools are organised, the way the educational hierarchy operates, and the way political decision makers treat educators, results in a system that is more likely to retain the status quo.

The most popular newspaper in Malta, The Times of Malta reported in its editorial (The pursuit of educational excellence, 2013, May 11) that most people in Malta agree “that investing in education is the key to our future prosperity. But many wonder whether we are doing the right things to achieve educational excellence.” Prof Borg, former dean of the Faculty of Education within the University of Malta is reported in The Times of Malta as stating that “in Malta generations of students have been schooled in lower order cognitive skills – memory work and regurgitation.....our educational expectations and pedagogy are not addressing the higher order cognitive skills” (Carabott, 2013, May 6). In this article Prof Borg, having around 26 years’ experience in teaching undergraduate and postgraduate students within the Faculty of Education, claims that “the effect of this model on prospective teachers is very sad passivity and a phobia of being critical. And although they gain awareness about this model’s repercussions, when they land a teaching job, they generally reproduce the school’s conservative and hierarchical culture.” University students are assumed to be more focused on passing their exams than to enhance themselves as critical and reflective learners. “They tend to study without reflecting on the purpose or strategy and to see the course content as discrete items of information" (Kinchin et al., 2008:377). This approach promotes surface learning where "students see tasks as external impositions and they have the intention to cope with these requirements" (Prosser & Trigwell, 1999:3) as opposed to deep learning where "students aim to understand ideas and seek meanings" (Prosser & Trigwell, 1999:3). Similarly Woods (1994) and Biggs (1985) suggest that deep learning takes place when adult learners reflect about and discuss their learning and their learning strategies.

However, one cannot solely blame the students for this kind of experience. University teaching tends to ignore how students prefer to learn and many times it does not embrace the notion that students are capable of transformation (not only accumulation) and this leads to non-learning outcomes (Kinchin, et al., 2008). Consequently university students are rarely provided with opportunities for self-exploration. On the other hand, the university system might have become so ingrained in traditional methods of teaching and learning that it would be very difficult to introduce or implement different approaches to teaching and learning. Very often we tend to forget that the way in which learning occurs is as important as the content. Consequently, this research will attempt to address this gap within our educational system.

Literature (Fullan 1993a, 1993b; Moon 2010) suggests that one way of bringing change within an educational system is through teacher education. According to UNESCO "teacher education institutions serve as key change agents in transforming education and society." Nonetheless, having pursued the Bachelor of Education course, besides recently, mentoring student teachers during their teaching practice, I have observed that often, after a four year course at University, student teachers end up teaching the way they were taught therefore reproducing the status quo in our educational system. This situation is apparently not novel or unique to Malta (Hartman, 2001). One of the reasons for this perpetuation may be because student teachers are adopting ineffective and inappropriate learning practices during their training and "thus, existing misconceptions about learning are perpetuated through automatic adoption" (Gamache 2002:279). Another reason could be that teachers are not aware of developments in pedagogical tools which nowadays vary from those they encountered while they themselves were being taught, and educators need the tools to engage in change productivity (Fullan, 1993a, 1993b). However, if the 'new' teachers are not going through a change themselves, how can this change be brought about in our educational system? If four years of Higher Education are not producing reflective and innovative teachers, how can we expect teachers to change their vision about teaching and learning? How can we expect the change many stake holders are calling for in our educational system to take place? If educators are to be agents for meaningful change, then this must be initiated in initial teacher education (Senge, 1990; Goodlad, 1991; Fullan, 1993a, 1993b).

Freire (1970) suggests that one way of challenging hegemony is through a process of conscientization that is, becoming aware of what is going on, reflecting critically upon it and engaging in a process of transformation. In reality, cultural reproduction is sustained by human beings and as such, transformation may take place through their conscientization. However, before this process can occur, one has to become aware of what one believes in. In other words, one must know oneself. Primarily one has to start to critically reflect, act upon and consequently transform oneself, before one endeavours to challenge hegemony and reproduction. According to Mezirow (2000) transformation occurs when our 'frames of reference' are challenged through cognitive dissonance which he terms 'disorientating dilemmas' and, consequently, changed through action. These dilemmas challenge our way of thinking, our meaning perspectives and our way of seeing ourselves in the world. Mezirow (2000:16) views 'frames of reference' as the structures of assumptions, beliefs and pre-understandings that are deeply connected to and embedded in our daily lives and they are the "results of the ways of interpreting experience." Both Freire and Mezirow view transformation as a process of praxis, that is, a process of critical reflective thought followed by action. Kincheloe (2005:22) similarly presents praxis as "an activity that combines theory and practice, thought and action for emancipatory end." Both Freire and Mezirow concern themselves with learning that makes sense to the learners, that is meaningful for the learners, with meaning making from experience and ultimately transformation. This perspective in learning shifts the focus from the transmission of knowledge, with the learners as passive recipients of expert knowledge, to transformational learning, where the learners are active agents in their own learning process.

Furthermore, Wilson (1975:44) argues that "to be interested in education is to view [the child] primarily as a learner". However, for too many years, teachers have prepared lesson plans according to their own preferred way of learning whilst ignoring the fact that all children process incoming information differently and, therefore, many times learning becomes disengaging for a number of students. Similarly, Novak (1998:120) argues that teachers tend to "focus on teaching activities and tend to ignore learning activities. They centre attention on how to teach a given topic, rather than on what is required for a learner to learn the topic. This stems, in part, from teachers' limited knowledge of the learning process". In this way, many children are left behind or build an image of themselves as non-learners. Yet, everyone can learn! But when and how does learning occur? What do we mean by the word 'learning'? 'Learning' is one of those words everyone uses, and seems to understand, but would be hard pressed to define. Learning is a complex process involving different mental processes and this will be explored and discussed in detail in Chapter Two.

With all of the above in mind, this study investigates and presents a model of the integrated use of Concept Maps and Vee Heuristics, paired with an awareness of the students' own learning processes through the 'Let Me Learn' advanced system, in teaching and learning in Higher Education. Vee Heuristics and Concept Mapping are effective metacognitive tools (Novak & Gowin, 1984; Georghiades, 2000; Kinchin et al., 2000; Mintzes et al., 2005) and so as to provide a metacognitive understanding to our learners and to the teacher, this research will make use of the Let Me Learn advanced learning system (Johnston, 1996, 1998, 2010). My prior knowledge and fifteen years of experience working with Let Me Learn in the classroom (Vanhear & Borg, 2000) was a value added component of this research since it facilitated my understanding of how learners apply their thinking processes therefore placing me in a much better position to negotiate meanings and experiences in a way which was meaningful for the learners. The implication is that students are encouraged to go through a process of reflection and to embark on a journey of transformative learning (Mezirow & Taylor, 2011). Quinnan (1997:42) asserts that to promote transformative learning, education should be a practice "predicated on the idea that students are seriously challenged to assess their value system and worldview and are subsequently changed by the experience". Similarly, Gamache (2002:291) believes "that what struggling university students need are practical, specific activities that will lead them toward an alternative conceptual framework within which they can ***re-create themselves as active learners*** [my emphasis]. Rather than just absorbing theory, students actually engage with it through a process of active self-reflection and self-direction".

This study is innovative in Malta, especially in Higher Education where the emphasis may be still focused on cognition at the expense of other mental processes which directly affect meaningful learning. This would help to bring about the shift from teachers as disseminators of information and students as passive recipients of knowledge to teachers as facilitators and empowering students to become lifelong learners by equipping them with the necessary tools of how to make their mental mechanisms work most efficiently for them in any domain. Gow and Kember (1990:320) suggest that "Tertiary education must challenge students enough to develop their powers of independent reasoning. Teachers, [teacher trainers - my addition], need to develop in their students an academic approach to their study, that is, an interest in what is learnt for its own sake and an active attempt to understand what is being studied". Learning meaningfully is crucial within any educational sector, let alone in Higher Education. Kinchin (2001) identifies ***dialogue*** [my emphasis] as a fundamental contributing component to meaningful learning. Similarly, Brockbank and McGill (2007) reveal that ***student/teacher interaction*** [my emphasis] is an important factor affecting the level of learning. Ramsden (2003) suggests that separating learning and teaching within Higher Education is a myth. In order for students to become agents of their own learning they need metacognitive strategies (Gamache, 2002; Bruer, 1993) and active self-reflection and self-direction are two kinds of metacognition (Gage & Berliner, 1998).

The significance of this study will lie in the fact that this multiple perspective mapping may shed some light upon how students may embark on a meta-learning journey and become more actively involved in their own learning process. Consequently, learning may become more relevant and meaningful, therefore challenging the premise that learning is something passive and superficial. This study will aim at revealing how learning can go beyond the memorisation of facts. Seriously taking into consideration cognitive, conative and affective processes, even in higher education, may bring about a change in the production of passive intellectuals (Pinar et al., 1995). Very often, many adult learners come to University relying on learning strategies that would have worked well for them in their previous learning experiences (Biggs & Tang, 2011). These would normally include rote learning through memorization and recall of facts. This could have been successful in passing exams but would not contribute to assist adult learners to become reflective learners and practitioners in their future work. Various authors propose that in order for students to become agents of their own learning they need metacognitive strategies (Bruer, 1993; Davidson & Sternberg, 1998; Hacker, 1998; Gamache, 2002). With this in mind, Concept Maps and Vee Heuristics are explored in this study as two tools which a wide body of theoretical evidence confirms as being intrinsically metacognitive (Vanhear, 2008). Concept Maps and Vee Heuristics are presented as two entirely innovative tools in our educational system, which, without any pretensions to being a quick fix, sure tool, can definitely serve as a stepping stone to challenging the prevailing transmission model of education. Using them in initial teacher training will hopefully lead to the use of these tools, with a greater emphasis on the learning processes, in our classrooms in order to respond adequately to the Education Strategy for Malta (2014-2024) and the Higher Education Strategy for Malta (2014) (Ministry for Education & Employment, 2014a, 2014c).

With all of the above in mind, the main aim of this study is to introduce the use of Vee Heurisitcs and Concept Mapping within Higher Education in Malta. This will be achieved by means of presenting a model of teaching and learning in Higher Education through the integrated use of metacognitive tools, namely, Vee Heuristics and Concept Mapping along with an awareness of how students prefer to learn so that all students are empowered to embark upon a meta-learning journey which eventually leads to critical reflection and meaningful learning. The main aim and the research will revolve around the premise that learning takes place through the interaction of cognition (thinking), affectation (feeling) and conation (doing).

The specific objectives are:

- To introduce the use of Vee Heuristics and Concept Mapping within Higher Education in Malta.
- To present Vee Heuristics and Concept Mapping as two metacognitive pedagogical tools that lead to meaningful learning thereby challenging passive, rote and superficial learning.
- To test and apply an innovative model within Higher Education in Malta by merging the use of metacognitive tools.
- To identify practical issues when applying this model.
- To investigate how Vee Heuristics and Concept Mapping can be more than simple cognitive tools.

1.2 Higher Education in Malta – An Overview

Malta is an island with an area of approximately 316sq.km and it is the most densely populated country in the European Union with around 450,000 inhabitants. Education always was and still remains a priority for Maltese governments since being a small island with a lack of natural resources, the island invests in and depends on human resources. Due to its colonial past, Malta’s educational system follows the British educational system. The educational system in Malta is divided into four major sectors (see Figure 1.1):

1. Early years
2. Junior years
3. Secondary years
4. Further and Higher Education

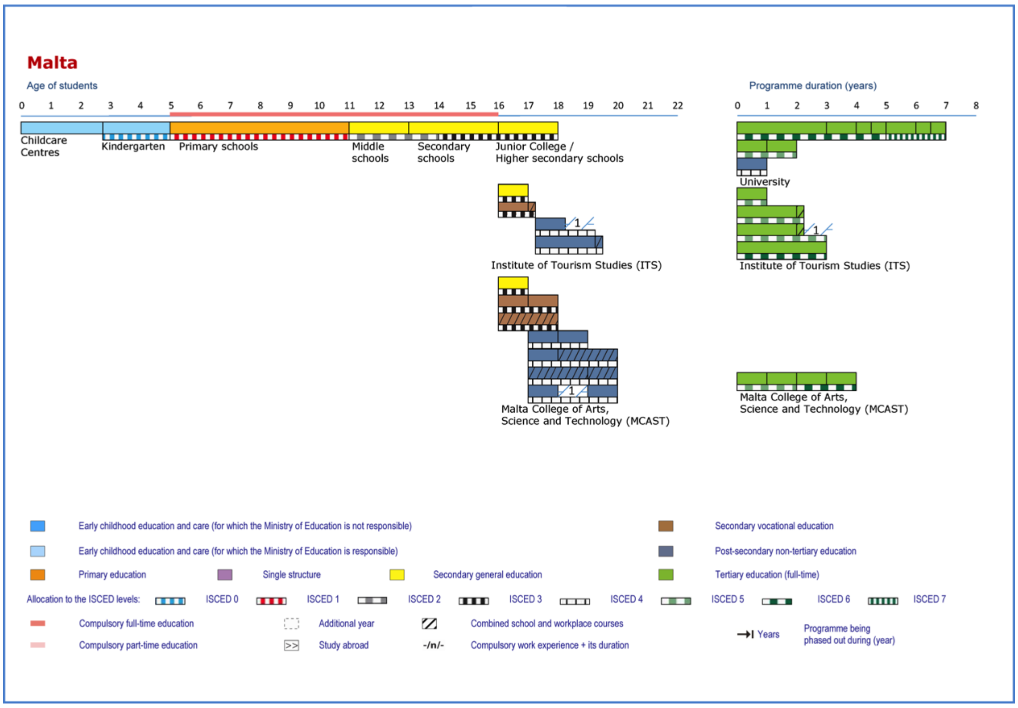

Figure 1.1: The Education Structure in Malta (EACEA/Eurydice 2014).

1.2.1 Further and Higher Education

The National Commission for Further and Higher Education (NCFHE) in Malta states that:

> Higher Education refers to all non-compulsory formal, non-formal and informal learning or research which serves to obtain a national qualification classified at MQF levels 5 to 8, or a foreign qualification at a comparable level, provided by licensed service providers.
>
> (NCFHE, 2015:20).

This emerges from the Education Act, Chapter 327 of the Laws of Malta that defines Higher Education as all non-compulsory formal, non-formal and informal learning or research which serves to obtain a national qualification classified at MQF levels 5 to 8 (see Figure 1.2), or a foreign qualification at a comparable level, provided by licensed service providers.

Higher Education in Malta is predominantly offered by the University of Malta. However, the Malta College of Arts, Science and Technology (MCAST) and The Institute of Tourism Studies (ITS) also provide programmes in Diploma courses at MQF level 5. Moreover, since 2009, MCAST also provides vocational degree programmes at MQF level 6. Besides these public providers there are a number of private providers of Higher Education operating in Malta.

The Malta College of Arts, Science and Technology (MCAST) is the main institution offering vocational education in Malta. The college also gives students the opportunity to pursue their studies up to Higher Education. MCAST offers a variety of vocational programmes ranging from entry level to Diploma, Higher National Diploma and in certain cases vocational Degree levels. MCAST works hand in hand with the industry to design qualifications which equip the students with the necessary skills and competences to qualify for employment. The college is also working towards becoming a Community College that is flexible to meet the lifelong learning needs of adult learners (National Team of Bologna Experts, 2011). Since October, 2009, MCAST has introduced vocational degree courses at MQF level 6 (see Figure 1.2).

The Institute for Tourism Studies (ITS) is a vocational education institution in Malta. It offers education and training to students enabling them to embark on professional careers within the Hospitality and Tourism Sectors. The institute aims to develop and enhance the students' intellectual abilities by offering a wide range of academic subjects which are complemented by the recreation of actual working environments. The ITS also provides work experience opportunities in the industry so that the transition into the world of work occurs smoothly. The ITS is firmly committed to providing an educational structure aimed at guaranteeing excellent standards of service within the Hospitality industry (National Team of Bologna Experts, 2011). The ITS offers courses at a higher/tertiary level equivalent to MQF level 5 (see Figure 1.2) and which lead to a degree at the University of Malta.

Malta Qualifications Framework			
8	Doctoral Degree		8
7	Master's Degree Postgraduate Diploma Postgraduate Certificate		7
6	Bachelor's Degree		6
5	Undergraduate Diploma Undergraduate Certificate Higher Education Certificate	Foundation Degree VET Higher Diploma	5
4	Matriculation Certificate Advanced Level Intermediate Level	VET Diploma [(e)]	4
3	General Education Level 3 SEC Grade 1-5	VET Level 3 [(d)]	3
2	General Education Level 2 SEC Grade 6-7 Secondary Education School Certificate and Profile (B)	VET Level 2 [(c)]	2
1	General Education Level 1 Secondary Education School Certificate and Profile (A)	VET Level 1 [(a) (b)]	1

ISCED 1997
ISCED 6 Second stage of tertiary education
ISCED 5 First stage of tertiary education
ISCED 4 Post-secondary education
ISECD 3 Upper secondary education
ISCED 2 Lower secondary education
ISCED 1 Primary education
ISCED 0 Pre-primary education

ISCED 2011
ISCED 8 Doctoral Degree/ PhD or equivalent
ISCED 7 Master's Degree or equivalent
ISCED 6 Bachelor's Degree or equivalent
ISCED 5 Short-cycle tertiary education
ISCED 4 Post-secondary education
ISCED 3 Upper-secondary education
ISCED 2 Lower secondary education
ISCED 1 Primary education
ISCED 02 Pre-primary education (3 years)
ISCED 01 Pre-primary education (0-2 years)

(a) Attainment of the Basic Employment Passport together with either the Adult Skills Certificate or NCFHE 8 Key Competences at Level 1 are also considered as a Full VET Level qualification
(b) The NCFHE recommends that a full VET Level 1 qualification should enjoy the same parity of esteem as a Secondary School Certificate and Profile (A)
(c) The NCFHE recommends that a full VET Level 2 qualification should enjoy the same parity of esteem as a Secondary School Certificate and Profile (B) / SEC Grades 6-7
(d) The NCFHE recommends that a full VET Level 3 qualification should enjoy the same parity of esteem as General Education Level 3/SEC Grades 1-5
(e) The NCFHE recommends that a full VET Diploma should enjoy the same parity of esteem as the Matriculation Certificate

Figure 1.2: Malta's Qualification Framework (MQF) to ISCED 1997 & 2011 reproduced from NCFHE (2015).

For the past 400 years the University of Malta (UoM) has been the major tertiary education institution in Malta, and therefore any discussion of higher education in Malta will naturally focus on this institution. Actually, the University of Malta provides services for 97% of the total tertiary level student population (NCFHE, 2009). Until recently the University was entirely modelled on the British university system, and three passes at GCSE 'A' levels were the standard admission requirement. Today, the trend is to Europeanise the admission requirements as well as course structures and the credit system. The entry requirements at present revolve around a Matriculation (Matsec) Certificate (MQF Level 4) (see Figure 1.2) which includes 2 Advanced Levels and 4 Intermediate subjects. This is referred to as ‘further’ education which can be defined as:

> all non-compulsory formal, non-formal and informal learning which serves to obtain a national qualification classified at MQF levels 1 to 4, or a foreign qualification at a comparable level, be it of an academic or vocational nature, and provided by licensed service providers.
>
> (NCFHE, 2015:19)

The past ten years have seen an increase in the number of students attending university (see Figure 1.3) and in investment in buildings (lecture rooms, theatres) and in laboratory facilities. Tertiary education is free for full-time students, whilst part-time students pay only nominal fees. Moreover, full-time students receive financial assistance from the government in order not to be too much of a burden on their families. From Figure 1.4 we can see that in Malta there are a higher number of females than males pursuing higher education at MQF levels 5-7. However, there is a higher number of males than females pursuing higher education at MQF level 8.

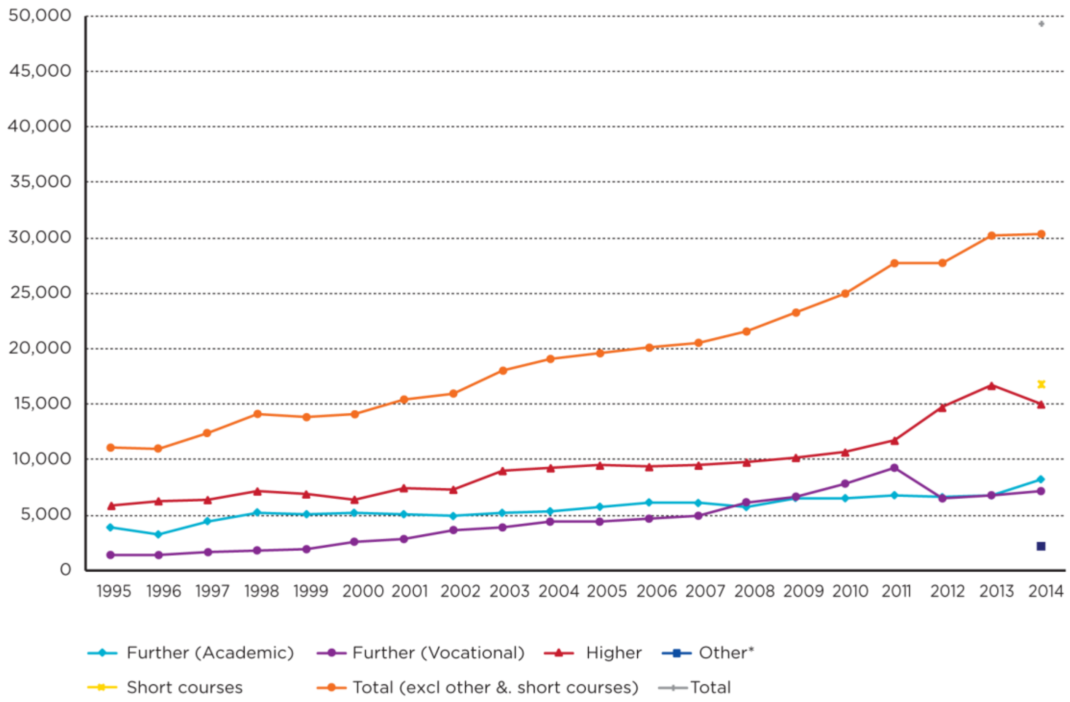

Figure 1.3: Total student population following Further & Higher Education in Malta reproduced from NCFHE (2015).

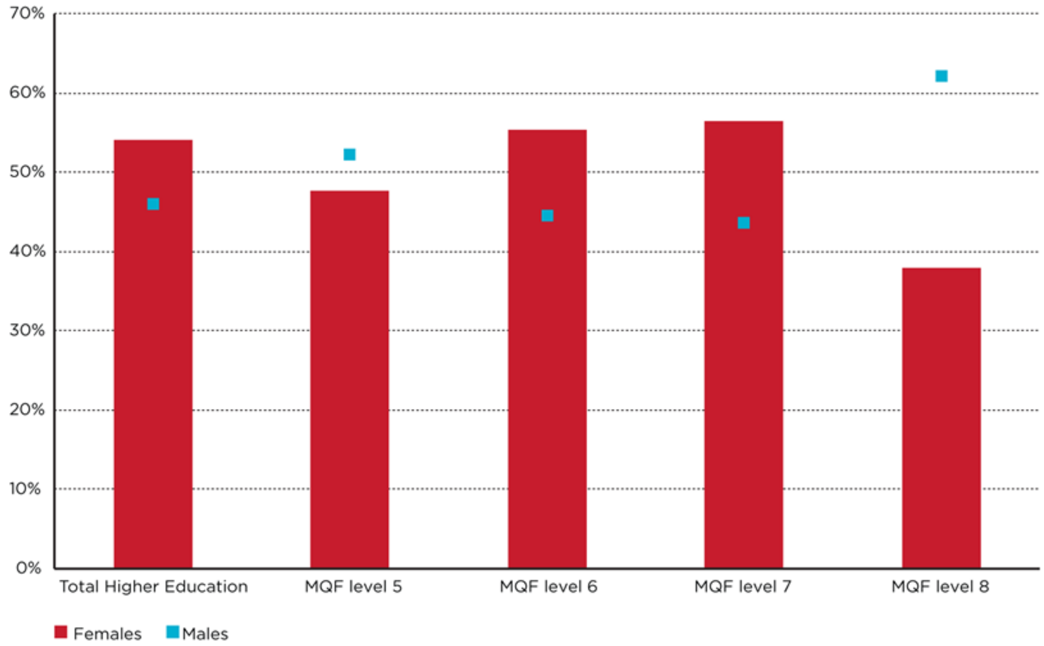

Figure 1.4: Student population in Higher Education by gender and MQF Level for the year 2014 reproduced from NCFHE (2015)

With around ten faculties and almost twenty institutes, the University of Malta offers a wide selection of courses at both undergraduate and graduate level. It awards degrees in Architecture and Civil Engineering, Arts, Management, Accountancy, Economics, Dentistry, Education, Engineering, Medicine and Surgery, Science, and Theology (see Figure 1.5). The University of Malta has a number of areas of excellence, such as the Diplomatic Academy (a joint venture with Switzerland), the Institute of International Maritime Law (with the International Maritime Organisation), the Mediterranean Institute, the Communications Centre, the Computer and Information Technology departments, and the European Documentation and Research Centre. The University is however especially proud of its Medical faculty whose graduates hold prestigious appointments at some of the world's top hospitals and clinics.

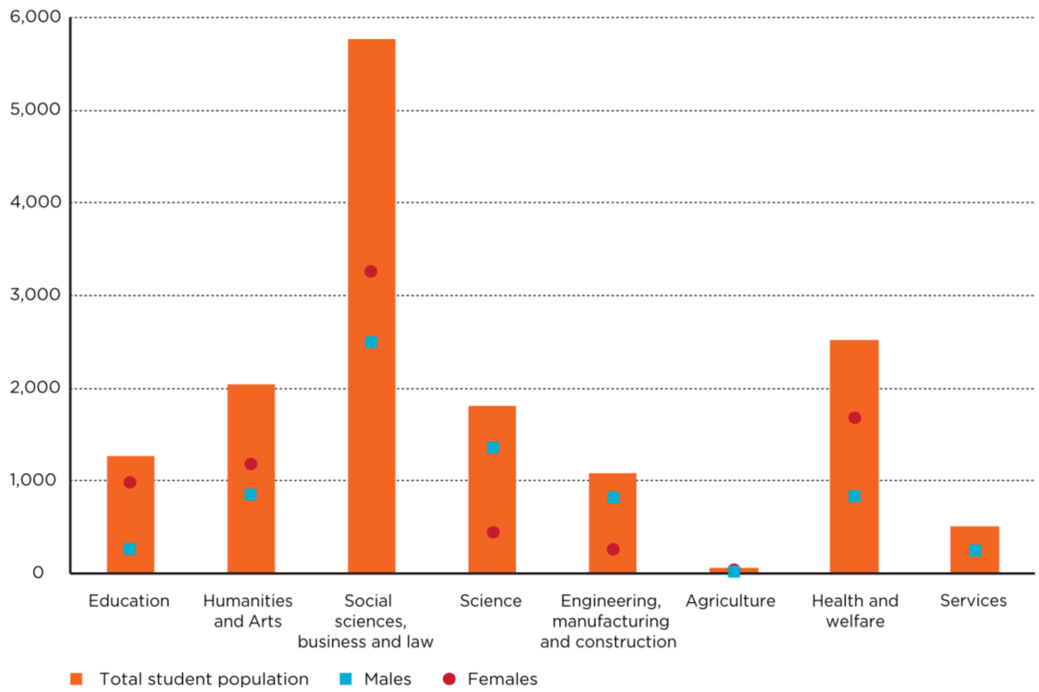

Figure 1.5 Total tertiary student population in Malta by Field of Study reproduced from NCFHE (2015)

Quality is naturally a priority for the University administration. To achieve this aim, the University of Malta invites professors from top foreign universities to act as external examiners. This also gives the academic staff the opportunity to discuss course structures and their content with their colleagues from overseas. Such outside monitoring and exchange of views ensures that the standards at the University of Malta are always at par with those of the best universities in Europe.

1.2.2 Further and Higher Education Strategy

In 2006 a National Commission for Higher Education (NCHE) was established so as to consult and advise Government through the Minister responsible for Education, to engage in a structured dialogue with all institutions, and inform the public on issues relating to sustainable development of the further and higher education sectors to meet the needs of society (NCHE, 2009).

On Friday, 3rd April 2009, a national conference was organised by the NCHE to present Further and Higher Education Strategy 2020, structured on the recommendations by the NCHE. The strategy presented suggests a series of practical and tangible measures focused on four main objectives as follows:

1. Attract more young students and adults into further and higher education
2. Ensure fair and open access to all students willing to further their studies
3. Make Malta a centre of excellence in education and research
4. Sustain public responsibility for adequate regulation, resources and funding to secure an inclusive, qualitative and responsive education system.

The recommended actions to fulfil this strategy are outlined in the following twelve priorities:

a. Attract more students to continue their studies after compulsory education into post-secondary and university studies.
b. Encourage students to undertake studies in areas relevant to Malta's economic, cultural and social development.
c. Attract foreign fee paying students to study in Malta in various fields of study and research.
d. Adapt systems for adults seeking Lifelong Learning opportunities
e. Secure fair and equitable access to further and higher education with particular focus on vulnerable groups.
f. Assure quality provision across all institutions and their programmes
g. Develop Malta's Qualifications framework and qualification recognition services
h. Increase the University of Malta's research capacity
i. Facilitate and promote student and teacher mobility
j. Ensure responsive systems through adequate governance and funding policies
k. Maintain active participation and co-operation within Europe and Internationally.
l. Develop and implement a long-term Investment Plan.

(NCHE, 2009:6/7)

Based on the considerations proposed in the Further and Higher Education Strategy 2020 (NCHE, 2009), the NCFHE followed with a Higher Education Strategy (Ministry for Education & Employment, 2014c) which sets four priority areas for action:

- Increase participation and attainment
- Reduce gender difference
- Encourage innovative content and programme design
- Increase employability and entrepreneurship

The Further and Higher Education strategy 2020 responds to the Bologna Process which has highly influenced the evolution of Higher Education in Malta. The Bologna Process originated when the ministers of education of France, Italy, the United Kingdom and Germany signed the Sorbonne Declaration (1998) on the "harmonisation of the architecture of the European Higher Education System." In this declaration the signatory countries agreed to work together towards having:

- a convergence of the overall Higher Education framework and cycle in an open European Area for Higher Education;
- a common degree level system for undergraduates (bachelor degrees) and graduates (master and doctoral degrees); and
- an improvement in student and teacher mobility, removing obstacles for mobility and improving recognition of degrees and academic qualification.

(National team of Bologna experts Malta, 2011; EACEA/Eurydice, 2010, 2012)

These initiatives led 29 European Ministers in charge of Higher Education to meet in Bologna in 1999 and sign the Bologna declaration (1999). Malta was among the signatory countries. The Bologna declaration also known as the Bologna Process aimed to create a European Higher Education Area (EHEA) by 2010. The Bologna Process does not aim to harmonise national educational systems but rather to provide tools to connect them (EACEA/Eurydice, 2010, 2012). Ministerial meetings are held every two years to take stock of the latest implementation stage and review its course through consensus (Bologna, 1999; Prague, 2001; Berlin, 2003; Bergen, 2005; London, 2007; Lueven, Belgium, 2009; Budapest & Vienna, 2010; Bucharest, 2012) (see Figure 1.6). This process has become a significant signpost in establishing a European Higher Education Area and it has become "one of the most powerful symbols of European-ness" (Curaj et al., 2012). Similarly, the executive summary of EACEA/Eurydice, (2012:7) states that the Bologna Process has transformed the face of European higher education. Nowadays it has further developed into a major reform encompassing 47 countries (EACEA/Eurydice, 2012).

Mobility of students and teachers	Mobility of students, teachers, researchers and administrative staff	Social dimension of mobility	Portability of loans and grants Improvement of mobility data	Attention to visa and work permits	Challenges of visa and work permits, pension systems and recognition	Benchmark of 20 % by 2020 for student mobility	Explore ways to achieve automatic recognition of academic qualifications
A common two-cycle degree system	Easily readable and comparable degrees	Fair recognition Development of recognised Joint degrees	Inclusion of doctoral level as third cycle	QF-EHEA adopted National Qualifications Frameworks launched	National Qualifications Frameworks by 2010	National Qualifications Frameworks by 2012	New roadmaps for countries that have not established a national qualifications framework
		Social dimension	Equal access	Reinforcement of the social dimension	Commitment to produce national action plans with effective monitoring	National targets for the social dimension to be measured by 2020	Strengthen policies of widening access and raising completion rates
		Lifelong learning (LLL)	Alignment of national LLL policies Recognition of Prior Learning (RPL)	Flexible learning paths in higher education	Role of higher education in LLL Partnerships to improve employability	LLL as a public responsibility requiring strong partnerships Call to work on employability	Enhance employability, lifelong learning and entrepreneurial skills through improved cooperation with employers
Use of credits	A system of credits (ECTS)	ECTS and Diploma Supplement (DS)	ECTS for credit accumulation		Need for coherent use of tools and recognition practices	Continuing implementation of Bologna tools	Ensure that Bologna tools are based on learning outcomes
	European cooperation in quality assurance	Cooperation between quality assurance and recognition professionals	Quality assurance at institutional, national and European level	European Standards and Guidelines for quality assurance adopted	Creation of the European Quality Assurance Register (EQAR)	Quality as an overarching focus for EHEA	Allow EQAR registered agencies to perform their activities across the EHEA
Europe of Knowledge	European dimensions in higher education	Attractiveness of the European Higher Education Area	Links between higher education and research areas	International cooperation on the basis of values and sustainable development	Strategy to improve the global dimension of the Bologna process adopted	Enhance global policy dialogue through Bologna Policy Fora	Evaluate implementation of 2007 global dimension strategy with aim to provide guidelines for further developments
1998 Sorbonne Declaration	**1999 Bologna Declaration**	**2001 Prague Communiqué**	**2003 Berlin Communiqué**	**2005 Bergen Communiqué**	**2007 London Communiqué**	**2009 Leuven/ Louvain-la-Neuve Communiqué**	**2012 Bucharest Communiqué**

Figure 1.6: The Bologna Process from Sorbonne to Bucharest 1998-2012 reproduced from EACEA/Eurydice 2015.

The reforms are based on ten action lines and objectives which governments and institutions are currently implementing in order to establish a European Higher Education Area (EHEA):

1. Adoption of a system of easily readable and comparable degrees
2. Adoption of a system essentially based on two cycles
3. Establishment of a system of credits
4. Promotion of mobility
5. Promotion of European co-operation in quality assurance
6. Promotion of the European Dimension in Higher Education
7. Focus on Life Long Learning
8. Inclusion of Higher Education institutions and students
9. Promotion of attractiveness of the European Higher Education Area (EHEA)
10. Doctoral studies and the synergy between EHEA and the European Research Area.

The reports after each meeting held every two years (see Figure 1.6) are "based mainly on official information about legislation, regulations and national policies which is complemented by statistical data collected by Eurostat and survey data from the European Student population provided by Eurostudent" (EACEA/Eurydice, 2012:16) and as such does not discuss any teaching and learning approaches, methods or pedagogies *per se* that are going on within EHEA.

Since the beginning of the Bologna Process in 1999, Malta has experienced structural changes at the University of Malta such as the implementation of the European Credit Transfer System (ECTS). There have also been changes on a national level such as the setting up of the Malta Qualifications Council (MQC) in 2005 and the National Commission for Higher Education (NCHE) in 2006. As from 2012, these two entities (MQC & NCHE) were joined together since they had very similar roles and they both aimed at serving as research and consultative agencies for the Government of Malta on further and higher education. Consequently, the entity's name was modified to National Commission for Further and Higher Education (NCFHE). EACEA/Eurydice 2012 reports that similar significant changes have been made in all participating countries and has enabled the European Higher Education Area (EHEA) to emerge.

A stock-taking exercise was carried out in 2009 and 2011 and it can be noted that overall, a lot of work has been done and Malta is well on its way to achieving most of the targets set by the Bologna Process (Gatt, 2013) (see Figure 1.7, Figure 1.8). Malta needs to develop more in the areas of Quality Assurance and recognition of prior learning in order to become an active player among EHEA countries (National Team of Bologna Experts, 2011; EACEA/Eurydice, 2012; Gatt, 2013).

Indicator	2009	2010/11
Indicator 1: Stage of implementation of the first and second cycle		
Indicator 2: Access to the next cycle		
Indicator 3: Implementation of National Qualifications Frameworks		
Indicator 4: Stage of development of external quality assurance system		
Indicator 5: Level of student participation in Quality Assurance		
Indicator 6: Level of International Participation in External Quality Assurance		
Indicator 7: Stage of Implementation of the Diploma Supplement		
Indicator 8: Stage of Implementation of ECTS		
Indicator 9: Recognition of Prior Learning		

Figure 1.7: Malta's rating in the stock-taking exercise in 2009 and 2010/11 (Gatt, 2013)

Green	Excellent performance
Light Green	Very good performance
Yellow	Good performance
Orange	Some progress has been made
Red	Little progress has been made yet

Figure 1.8: Summary of the scoreboard system (Gatt, 2013)

From the rating of the scorecard displayed in Figure 1.7, Quality Assurance remains a challenge as no improvement was registered. This requires that Malta makes efforts with respect to improving external quality assurance, mainly with respect to including the participation of students in the process. Malta also needs to make efforts to participate more actively in quality assurance on an international level. There is also need to do more work with respect to the recognition of prior learning, where a more structured and wider implementation needs to be developed in order to provide a wider access to Higher Education.

Nonetheless, EACEA/Eurydice 2015, reports that Malta has made slight improvements in these areas. The EACEA/Eurydice 2015 report gives a snapshot of the state of the implementation of the Bologna Process from various perspectives across the 47 countries of the European Higher Education Area (EHEA). This report presents information through comparative indicators, referred to as 'scorecard indicators', whose purpose is to describe the state of implementation in all countries from various perspectives. Malta is identified through the country code MT. The scorecard indicators presented in the EACEA/Eurydice 2015 report reveal that much work has been done with the recognition of prior learning, where national guidelines and policy for assessment of prior learning have been implemented (See Figure 1.9). A quality assurance system is currently in place and in operation nationwide; however it is still in the process of being evaluated against European Standards and Guidelines (ESG) in the EHEA (see Figure 1.10). The level of student participation in quality assurance has slightly improved (see Figure 1.11) as has the level of international participation in quality assurance (see Figure 1.12).

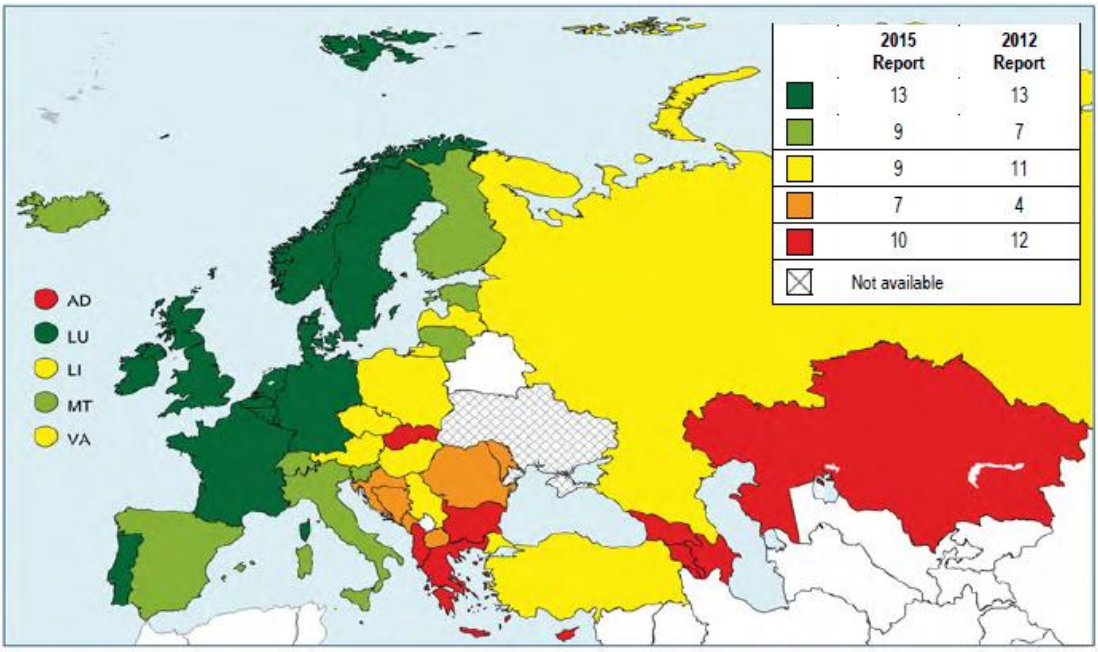

Figure 1.9: Scorecard indicator nº 11: Recognition of Prior Learning 2013/2014 reproduced from EACEA/Eurydice 2015.

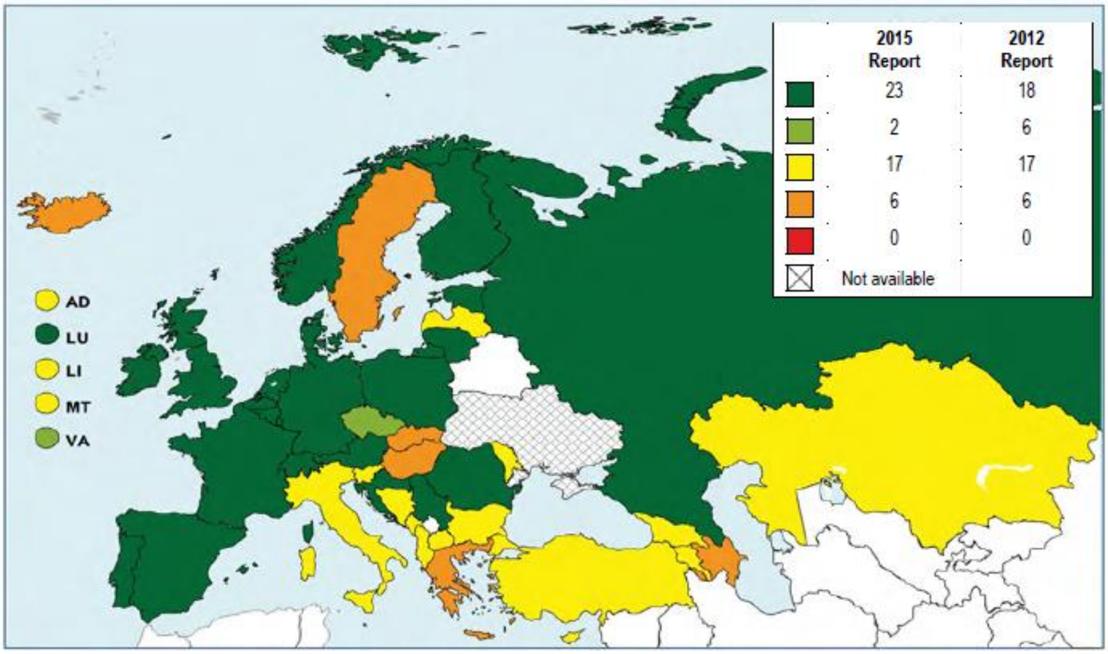

Figure 1.10: Scorecard indicator n° 7: Stage of development of external quality assurance system 2013/2014 reproduced from EACEA/Eurydice 2015.

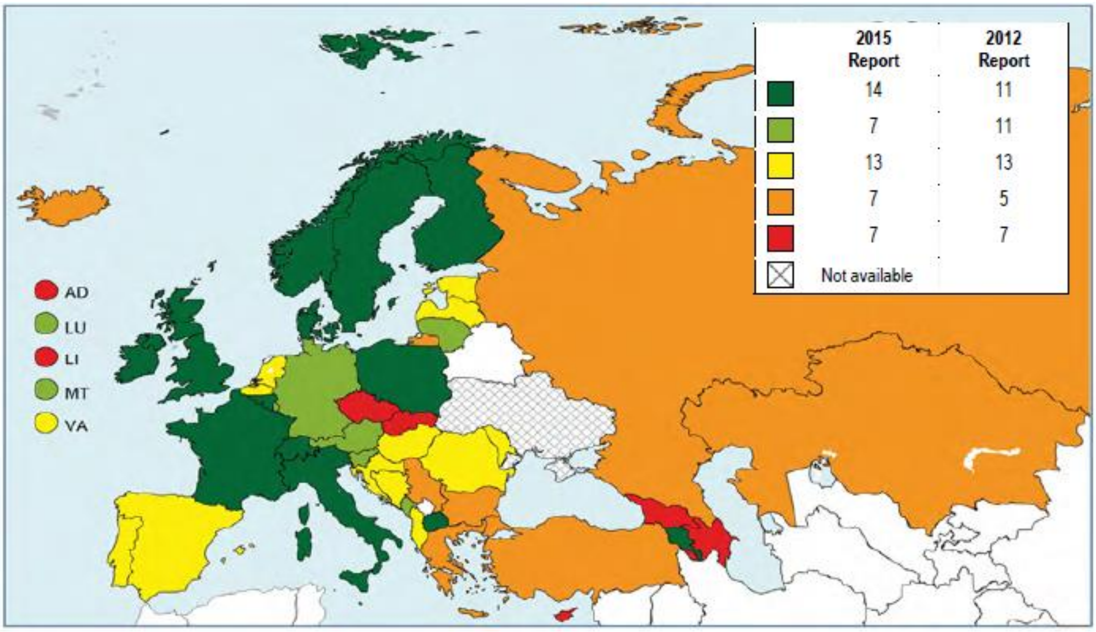

Figure 1.11: Scorecard indicator n° 8: Level of student participation in external quality assurance system 2013/2014 reproduced from EACEA/Eurydice 2015.

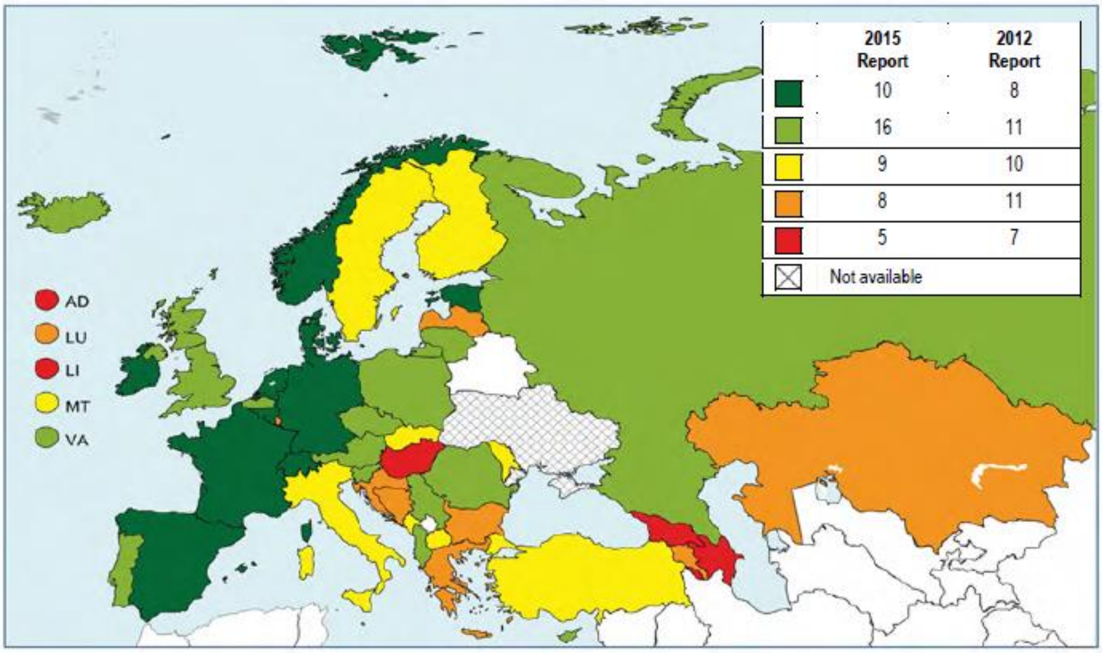

Figure 1.12: Scorecard indicator n° 9: Level of international participation in external quality assurance 2013/2014 reproduced from EACEA/Eurydice 2015.

All of the above reflects and responds to the Europe Strategy 2020 (European Commission, 2010) which sets specific targets that aim to reduce the early school dropout rate to 10% as well as increase the share of population aged 30-34 having completed tertiary education to at least 40% in 2020. With respect to tertiary education, only 15% of the population in Malta possess a tertiary Degree (Gatt, 2013). Malta still has 20.9% early school leavers (ESL) meaning that about one fourth of the young population is for some reason or other not engaged in further education. The difference is 9% higher than that of the EU average of 11.9%. The Government of Malta is committed to reaching the ambitious target of reducing ESL to 10% by 2020 (Ministry for Education & Employment, 2014b).

The current Minister of Education and Employment in the preface to A Strategic Plan for the Prevention of Early School Leaving in Malta (Ministry for Education & Employment, 2014b) states that “as a nation we should not only strive to have a lower rate of early school leavers and thus contribute to EU targets, but above all else we should do our best so that education and schooling become meaningful, engaging and relevant to students.” This is undoubtedly putting emphasis on the learning process and the strategy presented highlights the role of the teacher as one of the key players in addressing the ESL challenge. It emphasises the need for teachers’ continual professional development in order to equip themselves adequately to respond to the different individual needs of their students. Consequently, this research will hopefully contribute to national strategies that are responding to EU targets by presenting a clearer understanding of the learning process and pedagogical tools that facilitate meaningful learning.

1.3 Structure of the thesis

As exhibited in Figure 1.13, this Chapter provides an overview of the study and identifies the research problem leading to the study. It reviews the literature about the problem and identifies gaps which the study seeks to address. It also identifies three metacognitive tools namely: Concept Maps, Vee Heuristics and Let Me Learn (LML) which will be used throughout the study to help to address the research questions. A statement on the purpose of the study and research objectives is also set out. The chapter ends by emphasising the significance and contribution of the present study to Higher Education within a Maltese context and by a brief description of the structure of this thesis.

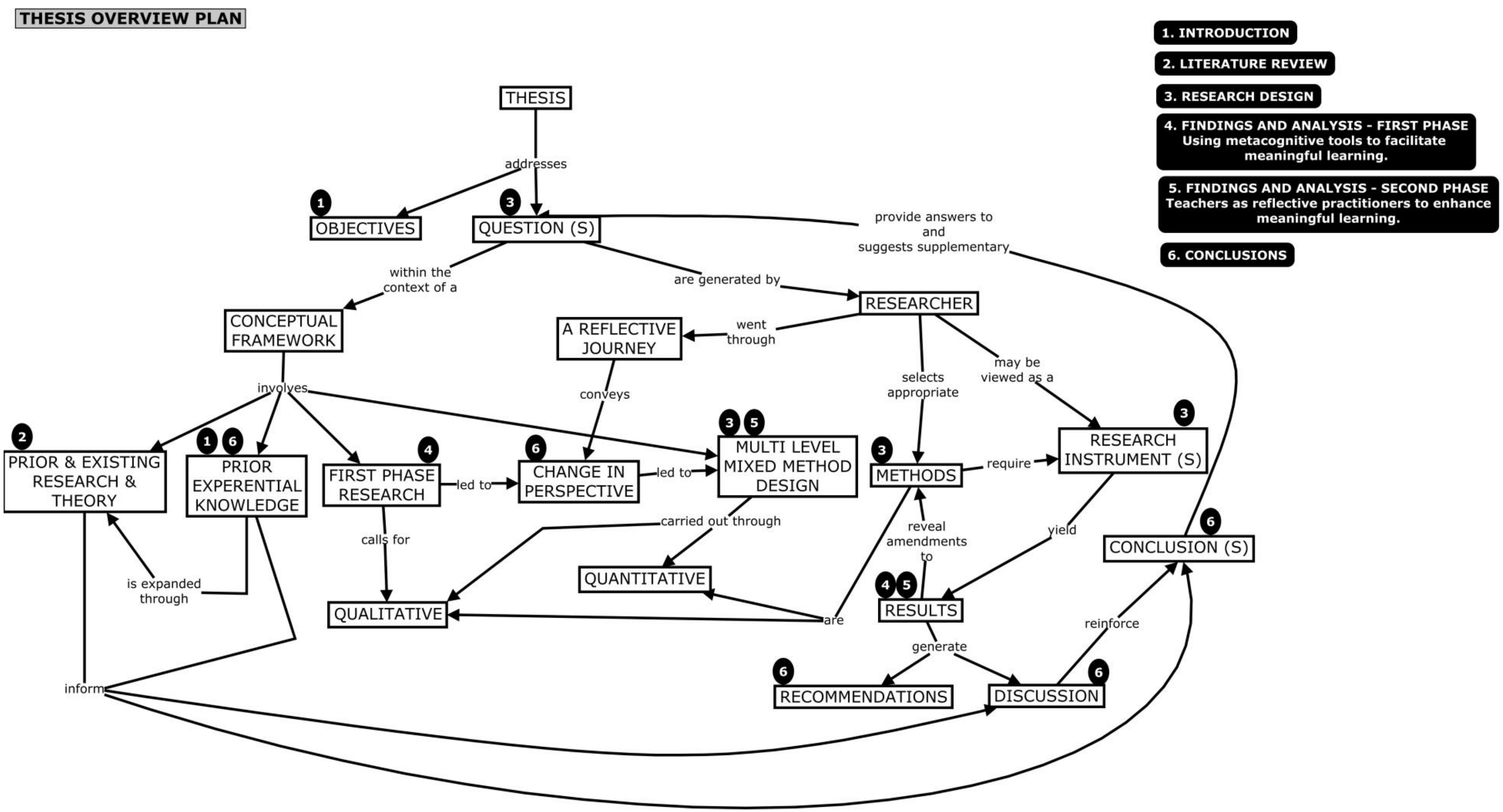

Figure 1.13: Structure of thesis

Chapter Two firmly grounds the theoretical framework of this research. It provides a combination of theoretical reviews and methodological evaluations pertaining to the learning process. It presents cognitive, conative and affective factors affecting learning. This chapter presents the theoretical basis of the metacognitive research tools used, namely, Vee Heuristics, Concept Mapping and Let Me Learn and shows how they respond to the theoretical framework set out in this study while giving a solid justification for the merging of their use. Finally this chapter discusses learning outcomes and a deep approach towards learning as these are related to Higher Education and the whole research.

Chapter Three identifies the research questions and justifies the choice of methodology and methods adopted in this study on the basis of the conceptual framework and research objectives. It explores the qualitative strategy applied in the first phase and how this has led and developed into a further multilevel mixed methods research in the second phase. Subsequently, it reveals sampling procedures and data collection tools and processes and methods of analysing data. Finally, it discusses the validity and reliability of this research while also presenting an ethical stance.

Chapter Four presents the research findings of the first phase of this study through qualitative inquiry. It reports in detail the process and the development of learning through the use of Vee Heuristics, Concept Mapping and Let Me Learn advanced learning system. The path that this study pursues is not to seek absolute truths or to promote the pedagogical tools as sure quick fix learning tools, but rather, to shed light upon a pedagogical process which captures personal structures of knowledge and their development so as to generate meaningful learning. This study also explores whether the use of these tools could lead to enhancing the student/teacher interaction which goes on within Higher Education. This chapter also provides an opportunity to make a distinctive contribution, both on a National and International level, to the literature by triangulating the LML data with Vee Heuristics and Concept Mapping and, as a result, it will provide a window to explore the benefits yielded through merging the use of metacognitive tools.

Chapter Five discusses how the qualitative findings and analysis in the first phase have led to a multilevel mixed method research in the second phase. It reveals and discusses the research findings obtained through an online inventory used to identify prospective participants for a semi-structured interview so as to delve deeper and give insights into the research question which developed from the first phase of the study presented in Chapter Five. It also analyses the data collected from the semi-structured interviews and discusses the implications as related to the whole study. Finally, it demonstrates the importance of teachers as reflective practitioners to enhance meaningful learning.

Chapter Six presents a conclusion to the study. It elaborates on the most salient aspects related to this whole thesis. It also describes the author's own professional, personal and transformational journey. Subsequently, it evaluates the study's research findings in relation to the research questions and objectives. It raises practical issues and considerations pertinent to learning within a Higher Education context and suggests recommendations and areas of further study based on this study's limitations. Finally, it highlights this study's original contribution to knowledge and its usefulness to researchers and policy makers within Higher Education.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This study is based on the assumption that learning is very complex involving cognitive processes and conative and affective factors and these also happen to be the theoretical foundation upon which the tools used in this research are based. The history of Higher Education has emphasized cognition and content where learning is often thought of as an intellectual achievement (Shulman, 2002; Land, 2004; Brockbank & McGill, 2007). However, Brockbank and McGill (2007:54) suggest that "teaching that is primarily about the transmission of knowledge will not engender the concept of a critically reflective learner because the one-way process of transmission is antithetical to the means by which a person can become a critically reflective learner." Similarly, Barnett (1994:20) proposes that learning as seen in this way is too simplistic and that "being a historian is no longer a sufficient rites de passage, higher education hears from society that an academic framing of knowledge is an inadequate preparation for the life ahead."

The aim of this section is to discuss some of the major theories of learning, to highlight strengths and weaknesses and to discuss the extent to which this can be seen as affecting the learning process. The discussion about the different learning theories will not be conducted with the intention of ending up with one fundamental truth about how learning occurs, but each of the theories will throw more light upon our understanding of how learning occurs and how this is related to this study.

2.2 Theories of learning: a discussion

2.2.1 Behaviourism: a simplistic view of conation

Learning involves a complex process and the diverse learning theories up to this day confirm this notion (Jarvis, 2006a, 2006b). One of the major learning theories which dominated the literature in the years between 1920 and 1950, and is to some extent still dominating today's classroom practices, is behaviourism (Forgas, 2000; Hergenhahn & Olson, 2005; Jarvis, 2006b; Gredler, 2009). According to the behaviourists, learning takes place when new behaviours or changes in behaviours are acquired as a consequence of an individual's response to stimuli. Behaviourism assumes that the environmental conditions (stimuli) and the overt behaviours (responses) are the primary agents responsible for learning and, therefore, learning is independent from any internal mental processes. This approach was initiated by two Russian physiologists Bekheterev (1928) and Pavlov (1928, 1955) and adapted by John Watson's (1925) classical conditioning. Watson is considered to be the father of behaviourism and the person who actually coined the term 'behaviourism'

(Hergenhahn & Olson, 2005; Jarvis, 2006b; Gredler, 2009). His work followed Thorndike's (1913a, 1913b) connectionism, Guthrie's (1935) contiguity theory and Skinner's (1935; 1938; 1968) operant condition which may also be known as behaviourist theories. The behaviourist theories of this period are identified as "S-R theories because they define learning as an associative link between a particular stimulus and a particular response" (Gredler, 2009:449). Behaviourist theories suggest that performance and behaviour are the primary factors affecting learning. Internal processes such as thought; ideas and consciousness cannot be reliably measured (Hergenhahn & Olsen, 2005) and therefore are to be disregarded. Behaviourism is based on observable and objective behaviours so it is positivist and quantitative. Consequently, it is easier to quantify and collect data when conducting research. In an era where quantification is important, it is not surprising that behaviourism still prevails (Jarvis, 2006b). The approaches presented by behaviourists are nowadays very useful in helping to change maladaptive or harmful behaviours in both children and adults (Gredler, 2005).

However, behaviourism has received criticism from researchers such as Bandura, 1977 and Sternberg, 2009. One major problem with behaviourism lies in the fact that all experiments are conducted with animals in a laboratory. Therefore, can this research be generalised to humans? (Sternberg, 2009) Another criticism is that learning may be a result not only of rewards for behaviours but it can also be social, i.e. as a result of seeing others being rewarded, we may learn by example (Bandura, 1977). Other critics argue that behaviourism is a weak theory because "human beings were assumed to have no free will but rather learned through a system of environmental stimuli and responses" (Daniels et al., 2009:3). Looking at learning only from a performance and behaviour perspective and disregarding feelings and thoughts would be making learning too simplistic and mechanistic, and we would be failing "to recognise the complexity of the human being and, therefore, of human learning itself" (Jarvis, 2006b:198).

Behaviourism in the context of this research may be linked to conation; however, James (2009:165) argues that behaviourism "focuses on a simplistic view of conation as goal-oriented action." At this point, it is worth focusing the readers' attention on defining conation as related to this study. Conation refers to the drive or will that leads to action. It refers to "the forces that drive the learner to apply some determination (or vigour) to the act of learning" (Seel, 2012:2999) and emphasises that primarily a learner must choose to learn if any kind of learning is to take place. Huitt and Caine (2005:1) define conation "as the mental process that activates and/or directs behaviour and action." Recent literature has focused on the concept of self-regulation or self-direction as an aspect of conation (Schunk & Zimmerman, 1994, 1998). However, Huitt and Cain (2005) reveal that this is only one aspect of conation; other aspects include directing, energising, persisting, achievement orientation, developing autonomy and curiosity, setting goals and strategies for success and volition or will. This makes conation quite a complex mental process which has, over the years, been disregarded since it has been overshadowed by the study of cognition and overt behaviour. Huitt and Cain (2005:2) suggest that "one reason the study of conation has lagged behind the study of cognition, emotion and behaviour is that it is intertwined with the study of these other domains and often difficult to separate." Nonetheless, conation is an important aspect of an individual's success in learning and "has a significant role in the development of educational process" (Huitt & Cain, 2005:13).

Furthermore, Banerjee (1994:52) makes a distinction between intellectual and motor conative activity:

> Conative effort in intellection, both voluntary and non-voluntary is called 'attention'. The intellectual effort is turned inwards to produce changes or modifications with the contents of consciousness. When the conative effort is turned outwards to determine the movements of limbs it is called motor conation or effort of movement.

However, James (2009) states that behaviourism presents only a narrow view of conation and Sternberg (2009:10) suggests that "Of the many critics of behaviourism, Gestalt psychology may be among the most avid" and this is what I shall be discussing next.

2.2.2 Cognitivism and cognition

During the early decades of the twentieth century, a perspective emerged in German psychology that was largely independent of the behaviourism that dominated American psychology at that time. This perspective originated through the works of German psychologists Max Wertheimer, Wolfgang Kohler and Kurt Koffka and referred to the perceptual aspects of learning. These psychologists, also referred to as Gestalt psychologists, emphasised the importance of organisational processes in perception, learning and problem solving and believed that individuals were predisposed to organise information in particular ways. One of the earliest discoveries of Gestalt psychology was that the way things look depends not just on properties of their elementary parts but also and more importantly on their organisation (Hergenhahn & Olson, 2005; Jarvis, 2006b; Gredler, 2009).

While the behaviourists looked upon the brain as a passive recipient of sensations that in turn produces responses depending on our experiences (nurture), the Gestalts viewed the brain as an active processor which organises incoming information (nature) (Hergenhahn & Olson, 2005). According to the Gestalts, a learner cognitively organises information in one way or another until the problem is solved.

Arguably, the single greatest development in educational psychology in recent decades has been the growing impact of models and research in cognitive psychology. Neisser introduced the term ‘Cognitive Psychology’, through his book bearing the same title, in 1967. He described individuals as dynamic information processing machines and made many correlations between human cognition and computing processes (Winograd et al., 1999).

In contrast and as a reaction to behaviourism, the cognitive theorists assume that the learner’s mental processes are the major factor in learning. These processes include how individuals perceive, interpret, and mentally store the information they receive from the environment. These theories focus on the ways that the learner’s processing and application of information change one’s thoughts and internal mental structures (Hergenhahn & Olson, 2005; Jarvis, 2006b; Gredler, 2009).

The areas of cognitive psychology that one finds are information processing, intelligence, reasoning, language development and memory. Cognitive developmental theorists have agreed that one must meet children at their current level and foster some sort of active processing and, historically, the cognitive development in humans has been studied in a variety of ways such as through Piaget’s stages of development, Vygotsky’s social development theory or Bandura’s social learning theory.

Jean Piaget was a turning point in the studies of learning and development because he was the first one to give importance to the child as an individual. He sees the child as “developing in isolation, behaving like a little scientist, making and testing hypotheses in order to construct an understanding of the world” (Lee & Das Gupta, 1995:6).

Lev Vygotsky, who was born in 1896 – the same year as Piaget, opposed Piaget’s image of human development as a lone venture in the world. For Vygotsky, the major task of a theory of development is to understand how the child acquires cultural tools. He argued that concepts, language, voluntary attention and memory are functions which originate in culture and are acquired through development in interaction between the child and another person (Lee & Das Gupta, 1995). Each of these functions appears first as an interpersonal process before it appears within the child as an intrapersonal process (Vygotsky, 1988).

Both Piaget and Vygotsky assume the active building up of knowledge and cognitive processes from very simple starting points. In fact, Piaget described four main stages of development and believed that all children go through these stages in the same order. Since Piaget was a biologist, he saw development as an evolutionary process in the following stages:

1. The sensorimotor stage – from birth to about 2 years
2. The preoperational stage – from 2 to about 7 years
3. The concrete operational stage – from 7 to about 12 years
4. The formal operational stage from 12 onwards.

Piaget argued that these levels represent the kinds of logical issues the child can deal with through a particular phase in his or her development. Moreover, it is useless to try and teach children, for example, in an abstract manner during the concrete operational stage since, as Piaget described, children at this age are able to perform the tasks assigned to them when they are perceptually supported because they are unable to reason out the operation logically (Lee & Das Gupta, 1995; Jarvis, 2006b; Gredler 2009).

Piaget suggests that children create their own intelligence at each level by baffling out inconsistencies between their bits of information or 'schemas' (the cognitive organisations and structure) and the reality of his daily experiences through the process of assimilation, accommodation and equilibration. Therefore a child goes from one stage to another through:

a. assimilation – which is the process of transforming an object to the child's own knowledge.
b. accommodation – which is the process in which children adapt their ways of thinking to new experiences
c. equilibration – which is the overall interaction between assimilation and accommodation.

Vygotsky's theory, too, is a stage theory. The transitions that take place between the biologically given functions, which Vygotsky calls 'primitive mental functions' and those culturally acquired are referred to, by Vygotsky, as the 'Natural History of the Sign' (Gredler, 2009). The stages in Natural History of the sign are: preintellectual; Intellectual: 'naively' psychological; dominance of external sign use and ingrowth or internalisation (Vygotsky, 1978). However, he believed that instruction is essential to reach the highest level of thinking. Vygotsky rejects all three processes brought forward by Piaget and concludes that the "developmental process lags behind the learning process and the fact that it does results in the zone of proximal development" (Jarvis, 2006b:164)

Vygotsky describes the zone of proximal development as "the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978:86). The Zone of Proximal Development (ZPD) bridges that gap between what is known and what can be known. Vygotsky claimed that learning occurs in this zone.

Nowadays, to some extent, both theories still hold true for children, particularly regarding the so-called logico-mathematical tasks. In other circumstances, especially for adults, readiness to learn new things appears to be much less developmental and more dependent on the nature of individual structures of knowledge, which are more or less appropriate to the requirement of the task at hand.

Cognitive psychology is probably the most dominant approach today. One of its strengths lies in the fact that it revolutionised the dominant behaviouristic perspective which was reducing all learning to behaviour thus neglecting internal mental processes. Learning in this way was too simplistic and mechanistic (Hergenhahn & Olson, 2005; Jarvis, 2006b). As Hilgard (1980:115) rightly puts it "Cognitive psychology came like a breath of fresh air, releasing psychological thinking in America from the restraints of behaviourism." In general, among the critiques of cognitive science, one comes across the challenge that it neglected the important role of emotions, consciousness and the physical environment in human thinking (Hilgard, 1980; Hergenhahn & Olson, 2005; Jarvis, 2006b; Sternberg, 2009; Sigelman & Rider, 2009). Gestalt psychology served as a springboard to cross boundaries from viewing learning as occurring mainly through performance and external behaviour to viewing learning as occurring through internal mental processes (Gredler, 2009).

Piaget's stage of development theory was pivotal in understanding how children think. However, his theory, like many other theories, has its flaws. Many psychologists believe that Piaget disregarded the effects of the learning environment. Others claim that his theory explains how children think, but not how children learn. Yet, many others claim that he underestimated many of the children's abilities in each stage of development. Critics of Piaget's methodology claim that he carried out his studies with a handful of participants who generally were his own three children (Sternberg, 2009; Sigelman & Rider, 2009).

Vygotsky's research was important because he revealed that children's cognitive development is affected by sociocultural factors. His key insight was that children's thinking develops through interacting with, and under the guidance of, more capable persons. Like Piaget, Vygotsky claimed that children are all the time seeking to discover new principles. However, he emphasised that many of a child's most important discoveries are guided by skilful tutors or peers. Needless to say, Vygotsky's work was highly influential in understanding better how children learn, particularly through his explanation of the zone of proximal development.

The literature reveals less criticism of Vygotsky's work than of Piaget's and this is corroborated by Zastrow and Kirst-Ashman (2010:124) who state that this could be because "he died very young before being able to develop his theory to the fullest." In actual fact, one of the most common criticisms was that Vygotsky's theory was too broadly used with regards to the cultural context. Robbins (2001) refers to this flaw as eurocentrism. Similarly, Wertsch and Tulviste (1992:554) argue that "one of the major challenges of a Vygotskian approach, then, is how to capture such facts about developmental progression without falling prey to ungrounded assumptions about the general superiority or inferiority of individuals or groups." Of most interest is the work of Daniels (1996, 2001) which gives a detailed overview of the strengths and weaknesses of Vygotsky's theory.

When discussing cognitive psychology, one cannot disregard the contribution by Bandura's social cognitive learning theory which not only proposes that individuals can abstract a range of information from the behaviour of others but can also make decisions about which behaviours to adopt and enact (Bandura, 1977). Basically, this theory states that humans can learn by observing other humans. With social learning theory, Bandura observed that external, environmental (extrinsic) reinforcement was not the only factor to influence learning and behaviour. He described intrinsic reinforcement as a form of reward such as pride and a sense of accomplishment. Bandura's social cognitive theory has sometimes been called a bridge between behaviourist and cognitive learning theories because it encompasses attention, memory and motivation (Jarvis, 2006b).

Bandura's work contributed extensively to shifting the perspective on learning from a focus on behaviour to the complex interplay between learner, environment and behaviour. Social cognitive theory has been, and still is, very influential in understanding learning. Terms such as motivation, retention, perceived self-efficacy and modelling are still considered as effective techniques for learning to take place (Hergenhahn & Olson, 2005; Jarvis, 2006b). Social cognitive theory, like behaviourism, acknowledges that classical and operant conditioning influence human behaviour. However, the difference is that Bandura claims that the social environment plays an important role in learning. Therefore, if learning is considered as occurring through modelling and observation, one cannot disregard internal mental processes, something which behaviourists reject.

Criticisms of social cognitive learning theory arise from its commitment to the social environment as the major influence on learning. However, critics suggest that there may be other influences such as genetic difference. Consequently, this theory is criticised for not taking into account individuality, along with context and experience, as mediating factors. Similar to behaviourism, it is criticised for not considering that emotions are connected to learning. Furthermore, critics such as Eastman and Marzillier (1984) and Durkin (1995) suggest that in social cognitive learning, students are considered to learn best as passive receivers of sensory stimuli as opposed to being active learners.

2.2.2.1 The information processing era

The information processing era through George A. Miller (1956; 1962) has provided two theoretical ideas that are fundamental to cognitive psychology. The first one is that short-term memory can hold up to only five to nine chunks of meaningful information. This concept of chunking and the limited capacity of short-term memory became a basic element of all subsequent theories of memory. The second one is that the human mind functions like a computer – receiving information, processing it, storing and retrieving it (Hergenhahn & Olson, 2005; Gredler 2009; Hergenhahn, 2009) (see Figure 2.1).

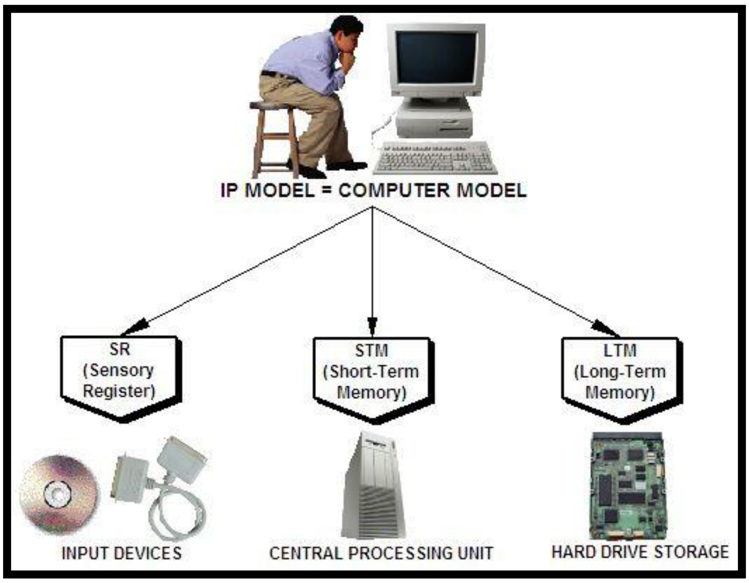

Figure 2.1: The Inspiration web above shows how Information Processing can be likened to the model of a computer. The Sensory Register would include input devices like CDs. Short Term Memory includes the Central Processing Unit. Long Term Memory would be viewed as the hard drive or storage. (Davis, Hummel & Sauers, 2006, available online http://epltt.coe.uga.edu/)

A relatively simple information-processing model is the one proposed by Waugh and Norman (1965). This model suggests that every item (stimulus) that is perceived enters Primary Memory (PM). Once in PM, an item will be lost or forgotten, unless it is rehearsed. Rehearsal can be overt or covert, intentional or unintentional, conscious or unconscious. If an item is rehearsed, it remains in PM and may enter Secondary Memory (SM). Secondary memory is considered to be a more permanent store. Once in SM an item need not be rehearsed to be maintained. Gredler (2009) refers to this model as the multistage model of memory where it also identifies three structures: the sensory register, short-term or working memory and long-term memory (see Figure 2.2).

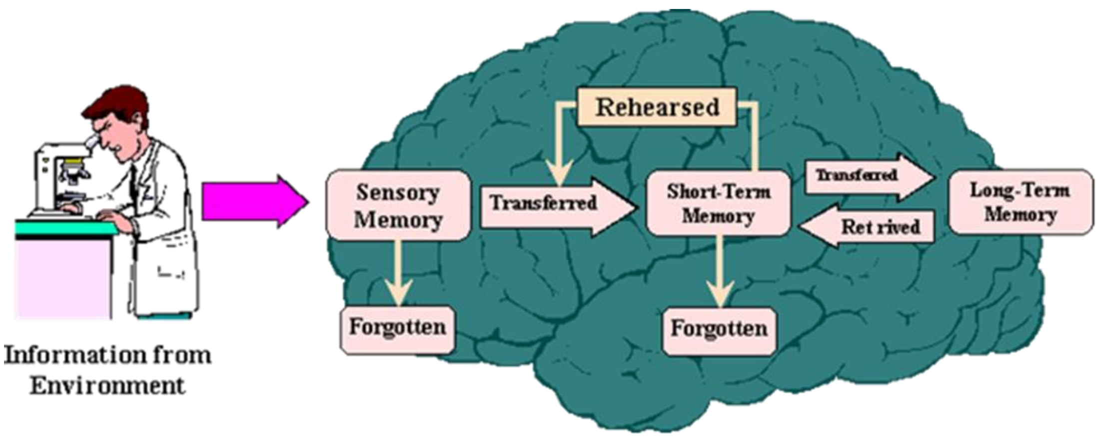

Figure 2.2: The Multistage Memory System available online www.nwlink.com

Through focusing on technology, Information Processing theories paved the way for research on how the brain works and consequently to understand better how learning occurs. One of the major issues in cognitive psychology and information processing is the study of memory. Through an understanding of how memory works, we are in a better position to help students to memorise more effectively; however, this does not mean that we are helping them to learn. One of the criticisms on Information Processing is that most emphasis is placed on understanding how information is processed rather than on how learning takes place (Sternberg, 2009).

The Information Processing paradigm of cognitive psychology views the mind in terms of a computer when processing information (see Figure 2.1). However, there are important differences between humans and computers. The mind does not process information like a computer, as computers don't have emotions. The mind is a complex dynamic system and not a computational system. "The brain is less like a computer, since computers store information in files that go unchanged, whereas the human brain constantly updates how it stores and networks information, based on that which the individual experiences." (Slavkin, 2004:39).

2.2.2.2 Intelligence

One of the most debatable areas of cognitive psychology is intelligence. Intelligence has been historically studied in a variety of ways and the oldest is through intelligence tests, such as the widely used Stanford-Binet Intelligence Quotient (IQ) test first adopted for use in the United States by psychologist Lewis Terman (1877-1956). Since then, IQ tests have been extensively used but they have come under increasing criticism for defining intelligence too narrowly.

One of the forerunners to challenge this definition of intelligence as measured by traditional intelligence tests is Howard Gardner. Gardner (2003) proposes that each individual possesses an array of intelligences, which he defines as biopsychological potentials. Gardner's most influential research demonstrates that there are multiple ways of perceiving the world and that everyone exhibits one or a combination of at least eight or nine different intelligences, which operate in varying degrees depending upon each person's individual profile of intelligence.

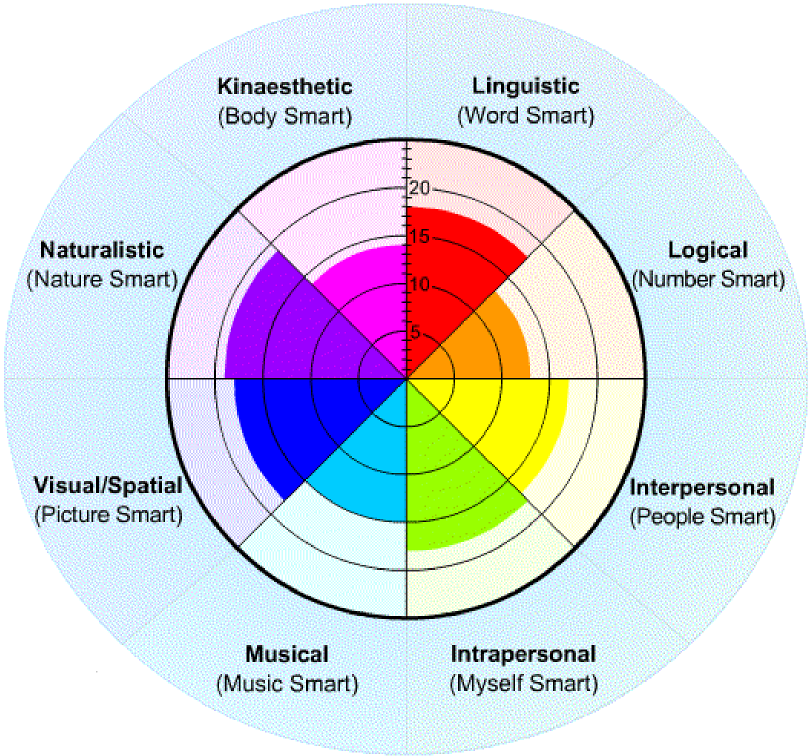

Figure 2.3: An example of a completed Multiple Intelligences wheel, available online.

Gardner's groundbreaking theories were first published in *Frames of Mind* (1983). He was a Harvard scholar, studying work on the development of children's cognitive processes based on the work of Jean Piaget. Through his own work on the development of cognition, he came to view Piaget's theory as too narrowly focused. In his own innovative theory he presents a new framework for considering children's potential. Gardner (1983) formulated a list of seven intelligences (see Figure 2.3): Linguistic intelligence, Logico-mathematical intelligence, Musical intelligence, Bodily-kinaesthetic intelligence, Spatial intelligence, Interpersonal intelligence and Intrapersonal intelligence. However, Gardner (1999) added Naturalist intelligence to the list while there is a possibility of a ninth intelligence which Gardner calls Existential intelligence, but this is still undergoing scientific verification.

Kincheloe (2004) reveals various criticisms of Gardner's work, one criticism of Gardner's Multiple Intelligence theory being that his research "reproduces the thought and knowledge of Western civilisation" (Berry, 2004:236) therefore disregarding gender, race and religion differences. Berry also argues that "his works, as scholarly and beguilingly penned as they are, have seduced the field of education into yet another Western logocentric, psychological categorization……once labelled, however, whether in the singular or the plural, intelligence acts as an economic, social, political, and cultural passport for some and for others, a cage" (Berry, 2004:237). Berry also states that Gardner holds "a western conception of knowledge as capital" (Berry, 2004:239) and therefore this cannot help improve prevalent education.

Another most common criticism of Gardner's Multiple Intelligence theory is that this theory is simply another cognitive style (Morgan, 1997). However, Gardner argues that this critical perspective belongs to those researchers and scholars who have for a long time argued for the existence of a general intelligence factor (known as the g factor) and who viewed intelligence as what is measured by intelligence tests. In actual fact, among the criticisms around the conceptualisation of Multiple Intelligences, Gardner himself has listed some of the main issues and his responses (Gardner, 1983:xxiii-xxvii; Gardner, 1995; Gardner, 1999: 79-114).

Nonetheless, Gardner's theory of Multiple Intelligences still has its utility and is very influential in education. The application of Gardner's theory requires teaching to be planned to provide learning experiences that help to develop different intelligences and this will make educators stop and reflect on their own practices. This perspective has helped educators around the world to view their students in a very different light. Instead of looking at students as either 'intelligent' or 'not intelligent', this theory provides a basis for educators to assume that all of their students are 'intelligent'. Educators, instead, look at their students' intelligence profile to learn which of their students' intelligences are already developed in order to keep on reinforcing them and those which aren't developed so that they will assist them to develop to their full potential (Slavkin, 2004). Furthermore, educational researchers "have tried to redress the balance by exploring the impact on learning of individual differences, giving taxonomies of learning styles" (Brockbank & McGill, 2007:39).

2.2.2.3 Learning Styles – a myth?

The early years of the twentieth century produced a vast number of psychological and educational research studies and related instruments that reveal a learner's preferred learning style (Honey & Mumford, 1992; Kolb, 2015). This is substantiated in the review by Coffield et al. (2004a, 2004b) where their project team identified seventy-one models of learning styles. The term 'learning styles' is used "as a description at the attitudes and behaviours which determine an individual's preferred way of learning" (Honey & Mumford, 1992:1). They argue that two people of similar intelligence and background who undergo a learning opportunity may be affected in very different ways, for example, one is enthusiastic while the second person is disaffected. Debello (1990) suggests that a learning style refers to "the way people absorb, process and retain information." Griggs (1991) suggests that learning style is one of the keys to an understanding of student learning and, likewise, Reay (1994) argues that, without knowledge of how learning occurs, it will be impossible to design a training programme which would make maximum use of everyone's learning ability.

There is vast literature about learning styles and numerous models (e.g. Coffield et al., 2004a, 2004b; Sharp et al., 2008b) and "nearly as many definitions of learning styles as there are theorists" (DeBello, 1990:203). The theory of learning styles has helped educators worldwide to understand that each person takes in the world around him/her in different ways. Pritchard (2009:43) claims that teaching with an understanding of individual differences enhances learning "when students are taught new and challenging material through instructional approaches that fit their learning style, the chances of their understanding and retaining the information greatly increases…the differentiation on instruction based on learning styles is imperative for meaningful education." Riding and Raynor (1998) support this argument and they also maintain that learning improves when learning styles are taken into account. Consequently, this has made teachers stop and reflect about their own practice and listen more to the learner's voice.

The 'learner's voice' in this context refers to the move to consult learners and provide opportunities for learners to voice their opinions about things that matter to them and that affect their learning. The learner's voice helps both the learner and the teacher to understand better how to make learning more meaningful for the learner. Spendlove (2009:76) claims that "learners can provide rich and penetrating evidence and insight into what works well in lessons and what does not." He also suggests that listening to the learner's voice may make the teachers feel vulnerable since it goes against the grain in which most adults themselves were brought up and gives the learners a kind of elevated status, consequently creating students-vs-teachers scenario within the classroom. However, Spendlove (2009:76) explains that this is a misconception and "that just because a pupil says something does not make it correct; what it does is provide a rich insight into pupils' perceptions which can provide incredibly valuable information about their beliefs and misconceptions" and as a result, teachers can then plan their learning programme accordingly and, more effectively.

Therefore, the learning styles era, has brought about more “respect for individual differences among children” (Stahl, 1999:5). Individual differences or learner variability (Meyer, Rose & Gordon, 2014) in the context of my research may present itself in the form of various factors such as differing thoughts, feelings, and ways of performing (Matthews et al., 2000). For instance, Brain (2000) suggests that while some incoming information is selected for attention, other information may be neglected. Brain’s work on how information is received is built upon both Broadbent (1958) and Treisman’s (1964) models, which show that information enters the senses through a ‘sensory buffer’ where the information is selectively filtered. This selectivity view is also presented in Sousa’s (2006) model. The way in which an individual perceives a situation can differ, based on a number of variables that can shift or change the point of initiation for that experience. Affective responses to experiences can physiologically change a learner’s performance (Immordino-Yang & Damasio, 2007) and these perceptions are considered as initial points of engagement or disengagement for learning (Meyer, Rose & Gordon, 2014) that can skew a learning experience even before it occurs.

Many theories of learning further distil the emotional and cognitive influences on learning. For instance, Forsten et al., (2006), Dweck and Masters (2008) and Brophy (2010), reveal how learners can interpret and respond differently to learning experiences in the face of challenge. The appraisal of a situation will determine how learners feel about a situation that may impact their performance. Marshall Shelton and Stern (2004) also suggest that having teachers who are attuned to understanding feelings, referred to as ‘emotional information’, would increase the effectiveness of teaching and student learning. Other authors, such as Matthews et al., (2000:16), state that there are differences in “stylistic variables such as willingness to respond and preference for speed over accuracy.” It is worth mentioning here that in most of the literature, factors contributing to individual differences were discussed as disparate units in the brain although they seem to play a major role, in one way or another, in the learning process. Therefore, according to this premise, learning styles do not give a comprehensive picture of who the learner really is.

In the United Kingdom, the Dearing report *Higher Education in the Learning Society* has endorsed learner-centred approaches and emphasises that learners should come to know their own learning styles. In relation to learning tasks, this report states that “an effective strategy is to guide and enable learners to be effective learners to understand their own learning styles and to manage their own learning”

(Dearing, 1997:24). However, various critics pose serious questions as to whether learning styles have had any effect on learning. Stahl (1999:1) states that “the reason researchers roll their eyes at learning styles is the utter failure to find that assessing children’s learning styles and matching to instructional methods has any effect on their learning.” Furthermore, he reinforces this argument by claiming that teachers who attended learning styles workshops had one thing in common “after one year, they had all stopped trying to match children by learning styles.”

Merrill (2002) explores the relative importance of learning style in determining an appropriate instructional strategy for a given instructional goal and proposes that “if an instructional experience or environment does not include the instructional strategies required for the acquisition of the desired knowledge or skill, then effective, efficient, and appealing learning of the desired outcome will not occur” (Merrill, 2002:99). Similarly, Slavkin (2004:42) suggests that “when students are taught new and challenging material through instructional approaches that fit their learning style, the chances of their understanding and retaining information greatly increases.” Merrill (2002) goes on to describe how instructional strategies should first be determined on the basis of the type of content to be delivered and learning outcomes – ‘the content-by-strategy interactions’ and second the learner styles and preferences are then used to ‘adjust or fine-tune’ the fundamental learning strategies – ‘learning-style-by-strategy interactions’. Yet again, Curry (1990) stresses that there is little proof that most learning styles are effective and that the theoretical grounds are quite dubious. Both validity and reliability are questioned in the learning styles research (Sewall, 1986; Coffield et al., 2004a, 2004b; Sharp et al., 2008a, 2008b). Lafferty and Burley (2009) claim that “learning styles are a myth…..they are at most an approximation of reality and offer little to learning process.” Critics of learning styles seem to concur that learning styles reveal one’s preferred way of learning but do not actually explain how learning occurs (Coffield et al., 2004a, 2004b; Debello, 1990; Sharp et al., 2008a, 2008b). The UK based think-tank group published the Demos report and they commented:

> The research evidence for these styles is highly variable, and for many the scientific evidence base is very slender indeed, since the measures are of doubtful reliability and validity. The authors are not by any means always frank about the evidence for their work, and secondary sources – often the ones that teachers are most likely to encounter – may ignore the question of evidence altogether, leaving the impression that there is no problem here…..There is usually even less evidence that, when applied in classrooms, these schemes really do help to enhance the character of teaching so that learning is improved.
>
> (Hargreaves, 2004:11).

The confusion in the array of terms, theoretical frameworks, instruments, applications and interpretations do not help in favour of the learning styles debate (Cassidy, 2004). However, Bernstein (2000:171) comments that "shattering any sense of unity in a field" may yet reveal different complex realities which could all be part of a comprehensive truth. This is to say that different perspectives in the learning styles debate, in one way or another, may in the long run help us learn something more about how learning occurs.

If this thesis is starting off with the assumption that learning is a complex process involving thinking, feeling and doing, then none of the learning styles such as Kolb's Learning Cycle, right vs left brain dominance, VAK, Dunn and Dunn will fit appropriately. This is because the learning styles research (DeBello, 1990; Coffield et al., 2004a, 2004b; Sharp et al., 2008a, 2008b) seems to take into account only one or two aspects of the mental processes taken into consideration for this study and consequently the inventories would only be revealing a part of who the student really is as a learner. One of the flaws of the criticisms of learning styles research could be the lack of a justifiable, comprehensive definition of learning to start with. Coffield et al. (2004b:1) pose a similar critical and reflective question: "How can we be serious about creating a learning society if we have no satisfactory response to the question, what model of learning do you operate with, and how do you use it to improve your practice and that of your students/staff/organisation?" My research takes into consideration that inventory which captures and reveals who the learner is in terms of cognition, conation and affectation as mental processes that affect how we learn.

Coffield et al. (2004b) recommend that due to the lack of a comprehensive model for learning, practitioners should supplement one model with a selection of others in order to gain a complete analysis of the learner. This recommendation is also made by Curry (1990). Similarly, Cassidy (2004:440) claims that "perhaps of more use, particularly from the practitioner's point of view, is work concerned with integration and rationalisation." Snow and Jackson (1992:85) also conclude that to date no one model of learning style had yet satisfied both the researcher and the educational practitioner and that "a common theoretical base for the concept of style will be found in an integrated model which emphasizes interaction and adaptation."

In a nutshell, the critical literature pertaining to learning styles is concerned with and addresses the following issues:

a) reliability and validity of the instruments are highly questionable (Coffield et al., 2004a, 2004b);

b) no justified and comprehensive definition of learning is given as a starting point (Coffield et al., 2004a, 2004b);

c) consequently, the instruments used do not focus on the actual mental processes involved in learning, but focus mainly on psychological/cognitive aspects (DeBello,1990);

d) the learning styles' instruments may reveal parts of who the learner really is but stop there. They do not provide metacognitive strategies which are effective in helping both the teacher and the learner to respond adequately to different learning tasks so as to be successful (Johnston, 1998, 2010; Coffield et al., 2004a, 2004b; Novak, 2010);

e) Many of the learning styles tests do not produce facts "but poor artifacts about human performance" (Novak, 2010: 20).

A common assertion among the arguments for and against learning styles is that the learners who are actively engaged in the learning process will be more likely to achieve success especially if the lexicon used is coherent and used with intention. Booth (2011:18) suggests that "intentionality is metacognitive." Metacognition will be discussed in detail in the following pages; however, at this point, it is worth discussing that an intentional strategy in the context of this research means that the learners are equipped with a strategy which they could use with intention so as to be successful in a particular task. Epstein (2007:3) suggests that "to be 'intentional' is to act purposefully, with a goal in mind and a plan for accomplishing it." Lichtinger and Kaplan (2011) state that these intentions and strategies very often vary in different educational contexts and types of tasks as well as with students with different characteristics and at varying levels of acquiring knowledge and skills. They also claim that intentional strategies have important implications for self-regulation. Self-regulation refers to the self-generated, reflective and strategic engagement in academic tasks (Zimmerman, 2000). This reflects the 'learning-how-to-learn' concept where students are encouraged and empowered to take more control of their learning process, thereby understanding how to make their mental mechanisms work most effectively for them, which would, consequently, lead to lifelong learning. Coffield et al. (2004b:1) refer to the importance of 'learning-how-to-learn' in the following way:

> Another impetus to interest in post-16 learning styles is given by a government policy that aims to develop the necessary attitudes and skills for lifelong learning, particularly in relation to 'learning to learn'. ……….The logic of lifelong learning suggests that students will become more motivated to learn by knowing more about their own strengths and weaknesses as learners. In turn, if teachers can respond to individuals' strengths and weaknesses, then retention and achievement rates in formal programmes are likely to rise and 'learning to learn' skills may provide a foundation for lifelong learning…….

Thus, the authors are highlighting the importance of metacognitive strategies. However, from Coffield et al.'s (2004a, 2004b) analysis, it appears that the majority of learning styles models lack metacognitive strategies and they do not provide a practical system for applying these strategies in order to improve learning success.

2.2.3 Humanism and the affective domain.

Evidently, behaviourist and cognitivist theories have been beneficial in helping educators around the world to understand how learning occurs (see Table 2.1). Nonetheless, various authors in the field argue that attention to cognition and overt behaviours has overshadowed the significance of feelings (Fineman, 2000; Forgas, 2000; Jarvis, 2006a, 2006b; James, 2009). Brockbank and McGill (2011:265) argue that "the traditional balance in academia and business tends to favour the cognitive and conative domains, to the relative neglect of the affective domain. When the cognitive and conative domains dominate a discourse, the affective domain is often dismissed, denied or devalued."

The two major dominant paradigms in educational psychology shown below (see Table 2.1) did not give much importance to the study of emotions. However, "emotions play a major role in behaviour and in human learning since they are at the heart of our personhood" (Jarvis, 2006b:177). Novak (1998:24) proposes that "feelings or what psychologists call affect, are always a concomitant of any learning experience and can enhance or impair learning. There does not appear to be a dominant theory of learning revolving around emotions. As Jarvis (2006b:177) states, "no learning theorist, to my knowledge, had actually researched emotional learning." However, ample research shows that there is a direct link between emotion and motivation (Gorman, 2004; Slavkin, 2004; Schutz & Pekrun, 2007; Berntson & Cacioppo, 2009).

	BEHAVIOURISM	COGNITIVISM
Principal concepts	Stimuli, responses, contiguity, reinforcement	Higher mental processes (thinking, imaging, problem solving)
Main Metaphors	Machine-like qualities of human functioning	Information-processing and computer-based metaphors
Most common research subjects	Animals; some human research subjects	Humans; some nonhuman animal research
Main goals	To discover predictable relationships between stimuli, responses, response consequences	To make useful inferences about mental processes that influence and determine behaviour
Scope of theories	Often intended to explain all significant aspects of behaviour	Generally more limited in scope; intended to explain more specific behaviours and processes
Representative theorists	Watson, Pavlov, Guthrie, Thorndike, Skinner, Hull	Gestalt psychologists, Bruner, Piaget, Vygotsky

Table 2.1: Principal differences between Behaviourism and Cognitivism (Lefrançois, 2012:194)

Abraham Maslow along with Carl Rogers is the leading proponent of the Humanistic Psychology School which emerged as a deliberate reaction towards behaviourism (Curzon, 2004). The humanistic approach focuses on the individual self, and learners are encouraged to be autonomous and to make their own choices. This approach fosters the idea that how learners are feeling can either hinder or empower the process of learning. Therefore, this approach does not separate the cognitive and the affective domains. While Maslow developed a theory of self-actualisation, "Rogers fashioned the idea of 'experiential learning', which would give to education a humanisitic orientation, leading to true freedom and self-fulfilment" (Curzon, 2004:111).

Maslow's hierarchy of needs which is often represented as a pyramid with five levels of needs proposes that, while people aim to meet basic needs they seek to meet higher needs in the form of a hierarchy. In the context of education, it follows that motivation to learning may not arise until certain basic needs have been satisfied (Curzon, 2004).

On the other hand, Weiner's attribution theory views the learner and particularly the learner's causal beliefs about success and failure as primary sources of motivation. This theory revolves around achievement. Ability, effort, task difficulty and luck are all identified by Weiner as the major factors affecting attributions. Lefrançois (2012:311) explains that the key concept in attribution theory is not the attribution of behaviour to one cause or the other that motivates behaviour, but “it is the emotions that occur as responses to specific attributions.”

A positive motivation practice improves performance and achievement. This will consequently lead to learning enthusiasm, commitment and co-operation. Many of the motivational theories such as Weiner’s attribution theory or Maslow’s hierarchy of needs, emanating from humanistic psychology, continue to contribute to and are still very influential in areas of learning (Jarvis, 2006a, 2006b; Gredler, 2009). Hays (2006:346) shows that positive emotions enhance motivation and help the learners to focus their attention on learning. He goes on to say that, “practices that enhance positive emotions, and help the learner perceive the task as interesting and personally relevant, help enhance motivation and result in increased effort.”

Daniels et al. (2009) suggest that Maslow’s ultimate conclusion that the highest levels of self-actualisation are transcendent in their nature “may be one of his most important contributions to the study of human behaviour and motivation.” Nonetheless, critics point out that our needs may not be ordered in as fixed a manner as Maslow’s hierarchy proposes. Huitt (2011) argues that an interesting trend related to Maslow’s work is that in spite of a lack of evidence to support his hierarchy, it enjoys wide acceptance. On the other hand, Jarvis and Gibson (1997:51) claim that the concept of needs is in itself quite “complex and confused” and that “while Maslow’s model has proved a helpful starting point for many discussions about the subject, it certainly does not exhaust the debate.” Another criticism is that motivational theories have failed to accommodate the role of culture in their framework. Therefore, although they may be valid in particular educational settings, they may not be universally useful or valid (Gorman, 2004; Zastrow & Kirst-Ashman, 2010).

Upon completion of this detailed discussion pertaining to various but not exhaustive learning theories, it is evident that learning is a complex process involving cognition, conation and affectation. Each of the different learning theories offers insights into the learning process. In the above learning theories’ literature, cognition, conation and affectation are presented as disparate mental processes. Nonetheless, some authors refer to an integration of these three mental processes (Novak & Gowin, 1984; Novak, 2010, Johnston, 1996, 1998, 2010) For example Seel (2012:17) claims that “it is widely acknowledged that academic achievement is the result of a complex interplay between cognition, affect and conation.” It would, therefore, be helpful to explore the literature and look out for theories that integrate aspects of cognition, conation and affectation. This is discussed in the following section.

2.2.4 Thinking, feeling and doing

Snow and Farr (1987:1) suggest that to understand learning instruction and individual differences requires:

> a whole person view that integrates cognitive, conative and affective aspects of learning and individual differences therein. The convenient fiction that has long separated theories of cognitive and affective behaviour, and caused the conative aspects of behaviour to be more or less ignored, must eventually be discarded in the analyses of aptitude, learning and instruction. These are three facets of individual performance, not isolated provinces, and they undoubtedly interact in complex ways during learning and problem solving.

Nonetheless, James (2009:166) claims that "only relatively recently has it become clear that in everyday life thinking, feeling and action are inextricably intertwined." Jarvis (2006b:23) suggests that as thinking, feeling and acting beings we transform our experiences "through all three dimensions, often simultaneously." According to Novak (2010:132) "meaningful learning must underlie the constructive integration of thinking, feeling and acting if learners are to be successful and achieve a sense of empowerment." Corno (2008:197) claims that "when the full range of conative processes is studied in conjunction with cognition, and when affect is seen as central and not peripheral to performance, human behaviour and performance can be better explained." Authors like Kyrö et al. (2011) and Stout Rostron (2009) also highlight an integration of feeling, thinking and acting. Within entrepreneurial learning both Stout Rostron (2009:265) and Kyrö et al. (2011:60) propose that "learning is a holistic process" and that "affectation, conation and cognition are combined into a dynamic and interactive process."

That the mind has three distinct parts has long fascinated Western philosophers, from as far back as Aristotle through to St. Augustine, Descartes, Pascal and Kant (Hilgard, 1980; Forgas, 2000; Hergenhahn, 2009). In the eighteenth and nineteenth centuries, the trilogy of the mind was the accepted classification of mental activities throughout Germany, Scotland, England and America. In the first half of the twentieth century, William McDougall, an American psychologist was the first to put it forward. According to McDougall, humans are born with a number of instincts and each instinct has three components which he called: perception, behaviour and emotion. He also believed that "they seldom if ever operate as singular tendencies" (Hergenhahn, 2009:364). Hilgard (1980:114) similarly reveals that McDougall “assumed that his reader was familiar with the classification of cognitive, affective and conative as common-sensical and non controversial.” In *Outline of Psychology* (1923) McDougall refers to the three faculty concepts as “generally admitted”:

> we often speak of an intellectual or cognitive activity; or of an act of willing or of resolving, choosing, striving, purposing; or again of a state of feeling. But it is generally admitted that all mental activity has these three aspects, cognitive, conative, and affective; and when we apply one of these three adjectives to any phase of mental process, we mean merely that the aspect named is the most prominent of the three at that moment. Each cycle of activity has this triple aspect; though each tends to pass through these phases in which cognition, conation, and affection are in turn most prominent; as when the naturalist, catching sight of a specimen, recognises it, captures it and gloats over its capture.

(McDougall, 1923:266)

The terms cognition and affectation are the most familiar, but less familiar is the term conation. Conation is derived from the Latin word “conatus”. It is one of three parts of the mind, along with the affective and cognitive. In short, the cognitive part of the brain processes incoming information, the affective deals with emotions and the conative drives how one acts on these thoughts and feelings. From this definition one can observe the three mental processes being explained in tandem; however, different philosophies and schools of psychology seem to have emphasised one of these aspects at the expense of the others (Hergenhahn, 2009). Snow (1980:194) explains that “it is not unreasonable to hypothesize that both conative and affective aspects of persons and situations influence the details of cognitive processing….A theoretical account of intelligent behaviour in the real world requires a synthesis of cognition, conation and affect. We have not really begun to envision this synthesis.”

Similarly, Kant’s tripartite division of the mind is described in his works (Kant, 1988) where he discussed the divisions transcendentally rather than empirically. In his classificatory scheme, pure reason refers to cognition, judgement to feeling, pleasure or pain, therefore, to affectation and practical reason to will, action or conation (Hergenhahn, 2009; Hilgard, 1980).

Later on, in Scotland, as a reaction to John Locke's tabula rasa, Sir William Hamilton stated:

> if we take the Mental to the exclusion of material phenomena, that is, phenomena manifested through the medium of Self-Consciousness or Reflection, they naturally divide themselves into three categories or primary genera;- the phenomena of Knowledge or Cognition, - the phenomena of Feeling, or of Pleasure and Pain, - and the phenomena of Conation or Will and Desire.
>
> (Hamilton, 1854 in Hilgard, 1980:110).

Concurrently, Britain's Alexander Bain was writing *The Senses and the Intellect* (1894) and *The Emotions and The Will* (1875). These two books became the standard textbooks for nineteenth century British psychology. Bain (1875:3) suggests that the "mind is distinguished by the three attributes or properties named Feeling, Volition and Intellect." Likewise, Hilgard (1980:11) states that Bain refers to these mental processes as:

I FEELING, which includes, but is not exhausted by, our pleasures and pains. Emotions, passion, affection, sentiment are names of Feeling.

II VOLITION, or the Will, embracing the whole of our activity, as directed by our feelings.

III THOUGHT, intellect or Cognition.

Hilgard (1980:111) traces the retreat from the discussion of this tripartite mental perspective directly to McDougall where, at that time, the need for a comprehensive classification of mental processes had subsided, "with McDougall the history of the trilogy of mind appears to have ended." Hilgard (1980) also questions whether the historical perspective on the trilogy of the mind may still have value nowadays and how we can read this history "so as not to fall into the trap of finding antecedents where they do not really exist" (Hilgard, 1980:115). He goes on to argue that "a distinction can be made, however, between distorting past history by reading the present into it, and trying to understand past history in its own context while seeking any light that such history throws on the present" (Hilgard, 1980:115). The persistence through which cognition, affectation and conation were recognised as major classification for more than two hundred years calls for our attention and therefore cannot be disregarded.

Authors such as Caviglioli et al. (2002) claim that models of learning should focus on thinking, feeling and acting and that "any education that does not address these three human forms of learning will produce unbalanced and, often, disengaged and disenchanted learners. By engaging and integrating all three, learning can become a meaningful experience." Snow and Farr (1987:2) suggest that research and attention should focus on principles governing the interaction of cognition, affectation and conation and that "this focus is desirable because we still know so little about how affect and conation modify or modulate human information-processing operations, especially those impacting on learning activities."

Nonetheless, one has to tread carefully, and, as Jarvis (2006b:200) points out, "the person is a complex phenomenon" and we do not know enough since "humanity and the human society are continually developing". Jarvis (2006b:195) points out other variables which are not mentioned in my study: "power and influence, formality and informality, socio-economic class and status, gender, age and role and so on are all important variables in social action, but we have not yet attempted to understand fully how they affect the learning process."

Therefore, learning is an intricate process involving different mental processes. Learning is part of our being and if one wants to be successful one must understand how one learns (Slavkin, 2004; Pritchard, 2009). Coffield et al. (2004b:1) ask a very simple question which triggers of critical reflection "How can we teach students if we do not know how they learn?" This scenario, however, leads us to a realization that learning can no longer be viewed as a process which involves solely cognition. While students are going through a process of thinking during learning, they are also doing and feeling. Novak and Gowin (1984:xi) in a preface to their book claim: "Human experience involves not only thinking and acting but also feeling, and it is only when all three are considered together that individuals can be empowered to enrich the meaning of their experience" (see Figure 2.4).

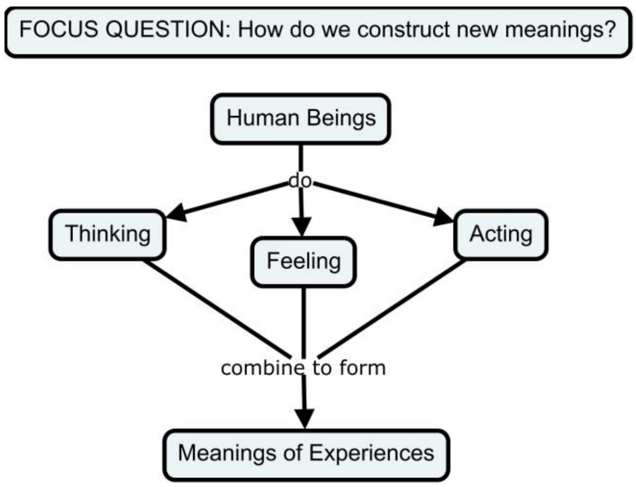

Figure 2.4: Meaning of Experiences (Novak & Gowin, 1984)

As a result, the understanding of learning has advanced significantly in the past few decades and increasing attention has been given to 'higher order' processes of understanding. Consequently, the term '**metacognition**' (thinking about thinking) has become a buzz word in educational settings. In order to learn, one must understand how one learns and then make sense of it so as to make one's mental mechanisms work most efficiently for him/her. This is the primary reason why educational research is nowadays focusing on **meta-learning** (learning about learning). "Meta-learning covers a much wider range of issues than metacognition, including goals, feelings, social relations and context of learning" (Watkins, 2001:1). Meta-learning is to make sense of one's own experience of learning and in this way the learners would be equipped with a life-long learning skill.

This study was limited to the theoretical foundation upon which the tools used in this research are based and which highlight cognition (thinking), conation (doing) and affectation (feeling). Below, I discuss the tools used in research in the light of the literature discussed above.

2.3 Vee Heuristics

Vee Heuristics originated in the late 1970s with D. Bob Gowin, who was interested in the study of philosophy and epistemology as they relate to education. The Vee Heuristics, also known as Gowin's V (see Figure 2.5), originated after a decade of research in science, science education, philosophy of science and philosophy of education. Gowin sought a way to help students understand the nature of knowledge and how this is constructed. Many of his students found it difficult to shed light on "the nature and purpose of laboratory work in science" (Novak & Gowin, 1984:55) and they also found it difficult to interpret research reports. Therefore, Gowin provided a set of five questions in order to help his students:

1. What are the telling questions? These are questions that tell what the inquiry seeks to find out.
2. What are the key concepts? These are the dozen or so disciplinary concepts that are needed to understand the inquiry.
3. What methods of inquiry (procedural commitments) are used? These are the data gathering or data interpreting methods used.
4. What are the major knowledge claims? These are the answers claimed by the researcher as valid answers to the telling questions.
5. What are the value claims? These are claims, explicit or implied, about the worth or value of the inquiry and the answers found in the inquiry.

(Novak, 1998:80)

However, many students still found it difficult to make a connection between the key concepts and the telling question or the objects/events under study. While trying to find a solution for the problems experienced by his students, Gowin came up with the idea of the knowledge Vee Heuristic, which is presented in Figure 2.5.

Very often learning starts off with a question and actually the ‘focus question’ leads the learner to trigger off a process of reflection, and it is placed at the top centre of the Vee since questions “are what drive the inquiry that leads eventually to new knowledge” (Novak, 1998:85). Chin et al. (2002) similarly claim that questioning lies at the heart of meaningful learning.

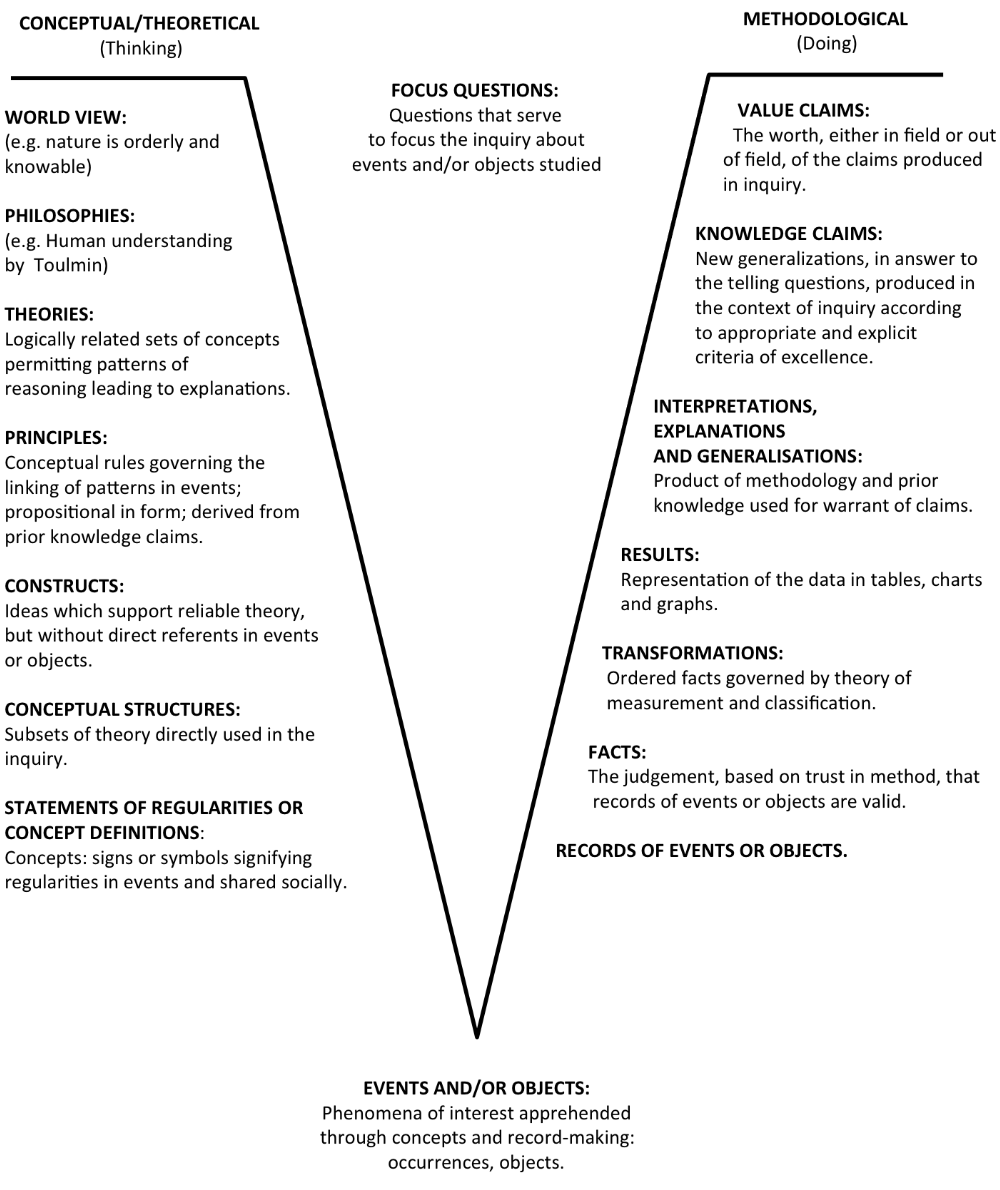

Figure 2.5: Gowin’s Vee Heuristic as presented in Novak & Gowin, 1984:56

The left hand side of the Vee is the thinking part of the whole process. This side reveals, to both the learner and the teacher, what knowledge and experiences have been developed over time about the issue in question. This is also another key part in the whole process, since, in this way, teachers have to stop and consider what the learner's prior knowledge and experiences are. This part also reveals how the learner feels about the whole issue in question, what is his/her relation to the question. In short, one's world view depends very much on how one personally constructs one's own vision of these events or objects (Novak, 1998). Very often certain teachers become so absorbed in delivering their learning content that they ignore the learning process (Novak, 1998). Thus, this side of the Vee is very effective in capturing the learners' thoughts, what they value, what is important in their life, how they feel about the whole issue and how they prefer to learn more about the issue in question. Novak (1998:84) maintains that:

> Our world view is that constellation of beliefs and values that shapes the way we see events and objects in the world, and also what we choose to care about and learn about. Our world view is shaped by our values and the emotional commitments we have regarding happenings in our universe.

The right hand side of the Vee focuses on the learners' action, what they plan to do in order to develop their knowledge and what new knowledge they have learnt. In addition, the learner can reflect and observe the development of the new knowledge taking place as related to his/her prior knowledge. Novak (1998) notes that the shape of a Vee was chosen above other shapes because from this shape one can clearly recognise and differentiate how both thinking (concepts and theories) factors and doing (methodological) factors are implicated in the process of constructing knowledge (see Figure 2.5). Similarly, Gowin and Alvarez (2005:41) propose that:

> It is this interplay between the left and right sides of the V that actively engages the mind to revisit previous knowledge, make judgments, discard, connect, verify, and make decisions about the structure of knowledge of a given event.

On the other hand, Åhlberg (1993) argues that the conceptual or thinking side and the methodological or doing side do not "stand up to scrutiny" since both sides demand thinking and conceptual work. Nevertheless, the Vee Heuristic is used to reveal explicitly the process of how one constructs personal knowledge. Through this process, learners can visually see how their knowledge has developed, and to reflect upon whether they had any misconceptions whilst communicating the new information they acquired.

One advantage in Vee Heuristics is that it helps the learners to connect meanings within their own knowledge structure. Research reveals that Vees empower the learners to take charge of their own learning (Novak & Gowin, 1984; Novak 1998; Åhlberg & Ahoranta, 2002; SEEPS, 2003; Åhlberg, 2004a;). Furthermore, the Vee Heuristic lends itself beautifully to a process of reflection and action where the learners' internal talking becomes visually overt and explicit. Consequently, through this process the teacher is made to stop and reflect on what the learner already knows and to reflect on his/her own practices in order to adjust to the learners' needs and therefore develop their knowledge. In this way, Vee Heuristics foster teacher and student interactions "resulting in creating meaning through negotiation of ideas" (Gowin & Alvarez, 2005:4).

This negotiation of meaning brings to mind Schön's (1983:132) 'reflection-in-action':

> In this reflective conversation, the practitioner's effort to solve the reframed problem yields new discoveries which call for new reflection-in-action. The process spirals through stages of appreciation, action and reappreciation. The unique and uncertain situation comes to be understood through the attempt to change it, and changed through the attempt to understand it.

It is also worth mentioning that, in this way, Vees serve also as advance organizers or what Novak (1998) refers to as 'mental scaffolds' since they help reveal valid ideas or misconceptions that the learners hold in order for teachers to plan their instruction accordingly. Novak also states that "Concept maps, and also the Vee heuristic ...are powerful tools to help students learn how to think critically and more creatively" (Novak 1989:3). Gowin and Alvarez (2005:5) claim that "learning is how the student grows from the familiar to the unfamiliar so that these two are progressively integrated and differences are reconciled." Vee Heuristics are considered to be a tool which effectively captures and reveals the interplay between what is known and what needs to be known (Novak & Gowin, 1984; Åhlberg, 1993; Åhlberg 2002b; Gowin & Alvarez, 2005), and therefore teaching, in this way, becomes more relevant to the learners' experiences and learning becomes more meaningful. Vee Heuristics help to organize one's thinking and to make action more competent and yielding. Moreover, students will feel better about themselves since they are actively participating in comprehending what they are doing, and how they are constructing their knowledge. In this way, educational value is enhanced since it not only promotes meaningful learning but helps students understand their own cognitive development thought processes (Novak & Gowin, 1984).

In this context, Vee Heuristics are believed to promote metacognition (Åhlberg, 1993, 2002a, 2002b; Novak, 1998; Åhlberg & Ahoranta 2002; Cañas et al., 2004, 2006, 2008, 2012; Gowin & Alvarez, 2005; Tomal, 2010; Larkin, 2010). Bruer, (1993:67) defines metacognition as "the ability to think about thinking, to be consciously aware of oneself as a problem solver, and to monitor and control one's mental processing." The Vee facilitates metacognitive instruction since the whole process makes the teacher structure an educational experience which revolves around metacognition, whatever the context of learning.

However, the Vee Diagram as presented in Novak & Gowin (1984) (see Figure 2.5) is it too complex and at times not practical since it is too time consuming. Similarly, when Åhlberg (1993) worked with Gowin's original Vee Heuristic, he found that his University students got confused with terms such as 'World Views' or 'Philosophy'. Acknowledging the fact that Vee Heuristics provide valuable data for both the teachers and their students, Åhlberg set out to improve Gowin's original Vee (Åhlberg, 1993; Åhlberg & Ahoranta, 2002) so as to facilitate its application and understanding.

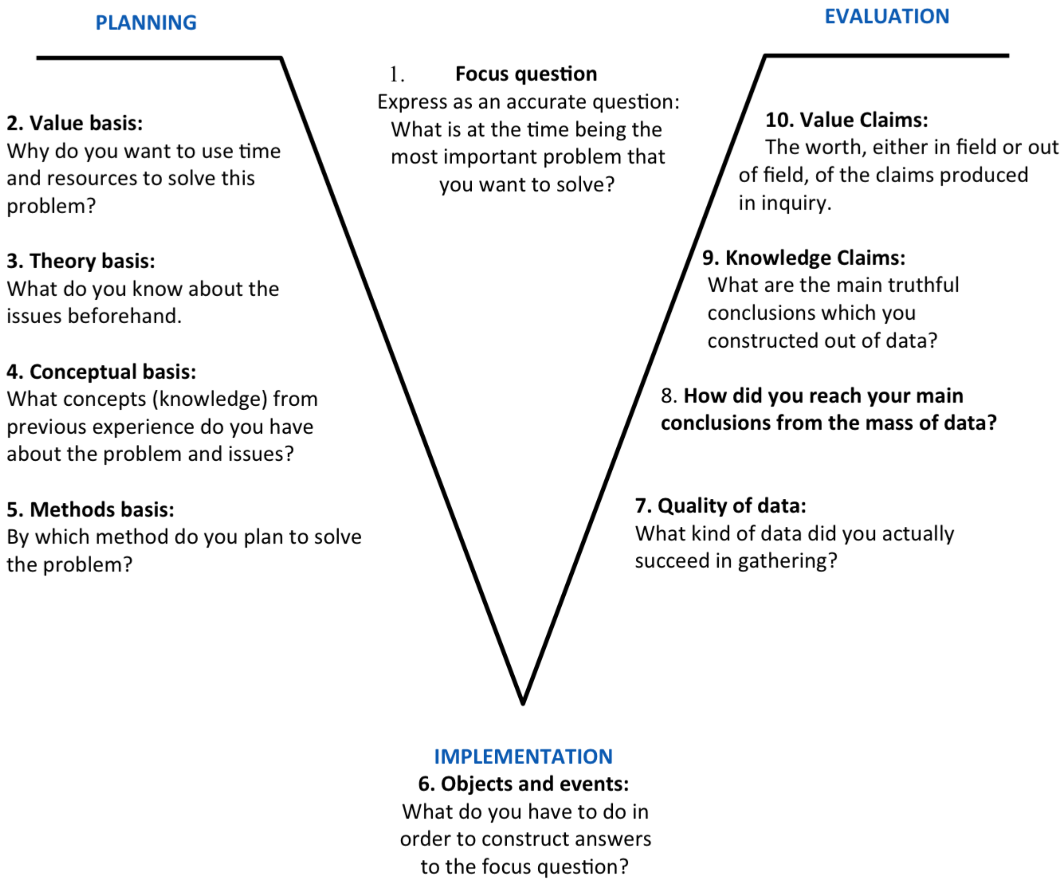

Figure 2.6: Åhlberg's improved Vee Heuristic (2002b)

Since the 1980s, Åhlberg has been concerned and involved in Action Research and he recognized, that the left hand side of the Vee could be the planning side, the right hand side could be the evaluative side while in the middle there would be the research question and a description of the implementations of the plans (see Figure 2.6). It is very easy to perceive that the three main phases: Planning, Implementation and Evaluation have their foundations in the three main phases of Action Research (Åhlberg & Ahoranta, 2002). Åhlberg's improved Vee Heuristics (see

Figure 2.6, Table 2.2 and Table 2.3) have withstood both theoretical and empirical testing from 1993 to 2005 and have been applied to Environmental Education in Finland for several years and are still being applied (Åhlberg, 1993; Åhlberg, 2002b; Åhlberg & Ahoranta 2002; Åhlberg & Ahoranta 2004; Wheeldon & Åhlberg, 2011).

Main parts of the Vee heuristic/ Gowin's Vee	**Main parts of the improved Vee heuristic**
CONCEPTUAL/THEORETICAL (Thinking side)	PLANNING
EVENTS AND/OR OBJECTS	IMPLEMENTING: Description of what has been really done in order to answer the focus question(s).
METHODOLOGICAL (Doing side)	EVALUATION

Table 2.2: Comparing the main parts of Gowin's original Vee to Åhlberg's improved Vee Heuristic. (adapted from Åhlberg, 2002b)

The main elements of Gowin's Vee Heuristic ***(Novak & Gowin 1984; Novak 1998 & 2002)***	**The main elements of the improved Vee heuristic** ***(Åhlberg 1993 – 2002; Åhlberg & Ahoranta 2002)***
1. Focus questions	1. Focus question(s)
2. World view	2. Value basis: Why do you want to spend your life, time and resources to answer the focus question(s)?
3. Philosophy/epistemology	3. Theoretical basis: What is your tentative theory in the beginning of your inquiry? What do you know in the beginning of your inquiry?
4. Theory	
5. Principles	
6. Constructs	
7. Concepts	4. Conceptual basis: What are the main concepts of your theoretical basis? They act like lenses or a net by which you try to answer the focus question(s).
-	5. Methodological basis: What methods do you plan to use to answer your focus question(s)?
8. Events and/or objects	6. Description of what has been really done in order to answer the focus question(s).
9. Records	7. Records
10. Transformations	8. Transformations
11. Knowledge claims	9. Knowledge claims
12. Value claims	10. Value claims

Table 2.3: Comparing the main elements of Gowin's original Vee to Åhlberg's improved Vee Heuristic. (adapted from Åhlberg, 2002b)

Nonetheless, one of Åhlberg's doctoral students, Vuokko Ahoranta, adapted Åhlberg's improved Vee Heuristic for use with her students. Ahoranta's version of the Vee (see Figure 2.7) was implemented during three scholastic years (1997 – 2000) in various schools and in different school subjects in Finland (Åhlberg & Ahoranta, 2002, 2004). From this Vee in its simplest form, one can observe that within the whole process there is the construction of the first Concept Map prior to the whole project and the construction of the second Concept Map after the whole project. By comparing these two Concept Maps, the learners will be able to observe how their knowledge was developed and constructed and any misconceptions present. Åhlberg and Ahoranta (2002:124) suggest that Vee Heuristics give:

> useful, important and interesting knowledge about pupils' thinking, feeling and learning. It probably promotes pupils' metalearning and metacognition as they know more about their own learning and thinking as a result they may better monitor and promote their own learning. Also the teacher has better knowledge of pupils and their thinking, learning and development.

The quality of the research design, methods, data, analysis and results in Ahoranta's work was evaluated according to the theoretical framework as presented by Miles and Huberman (1994): objectivity, auditability, credibility, transferability and application (Åhlberg & Ahoranta, 2002, 2004).

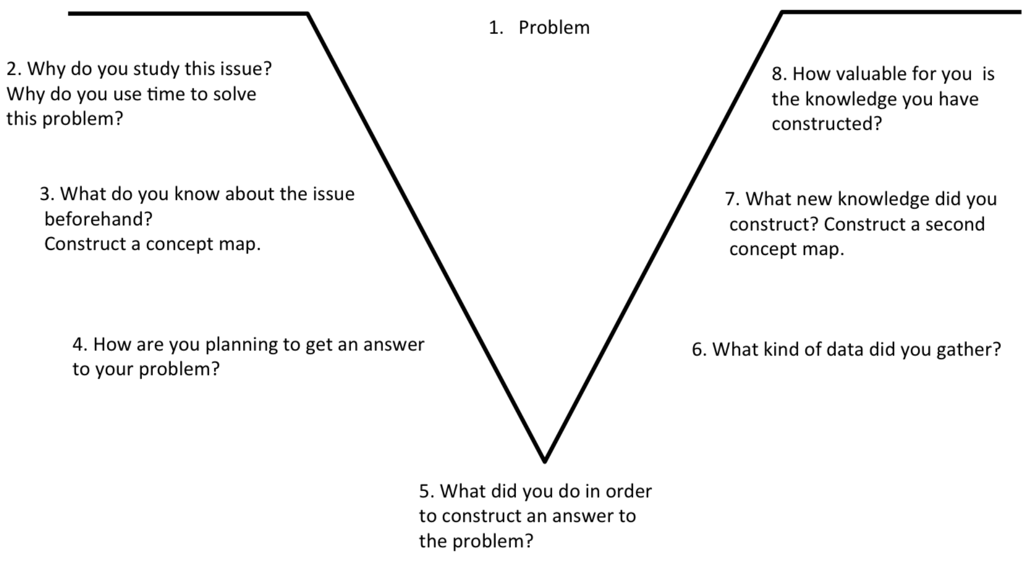

Figure 2.7: Ahoranta's version of Vee Heuristics is a modification of Åhlberg's (1993) improved Vee Heuristics, which was adapted from Novak & Gowin, 1984

The general discussion of results focused on concepts and propositions and their development, and show that the use of Vee Heuristics and Concept Maps reveal personal complex structures of knowledge and how this is integrated and developed within a student's cognitive structure. Although Ahoranta stated that Vee Heuristics give valuable information "about pupils' thinking, feeling and learning"; this research discussed and presented only results related to cognition, and failed to show how or what kind of feelings were revealed through this learning process. This may be due to the fact that, like various other authors, (Tomal, 2010; Larkin, 2010), they view Vee Heuristics and Concept Mapping from a cognitive perspective. One of the aspects of Vee Heuristics which Novak & Gowin (1984) emphasise is the aspect of 'feeling significance'. Likewise, Gowin and Alvarez (2005:44), when explaining how the Vee's elements are constructed, call attention to the importance of 'feeling significance' and state that "the experience of significant feelings in the context of educating gives students reasons to choose to learn." However, very often various authors tend to overshadow this aspect and highlight cognition and action instead. Novak (1998) highlights this aspect and refers to it as "emotional commitment" and it is also referred to as one of the requirements for meaningful learning to take place as described in the next section (see Figure 2.9, p.62). Åhlberg & Ahoranta (2002, 2004) have used Concept Maps as part of the improved Vee Heuristics, and the next section will provide a succinct history of Concept Maps and their theoretical framework, and explore their use.

2.4 Concept Maps

Concept Maps emanated from a 12-year longitudinal research programme carried out by Joseph D. Novak and his graduate students at Cornell University. It started off as a new paradigm in cognitive learning which highlights the learner's mental processes as the major factor in learning, therefore opposing the behaviourists and logical positivism (Novak & Musonda, 1991).

During the 1960s, behavioural psychology and logical positivism were the dominant spheres of influence around which learning revolved. Furthermore, with the revival of Jean Piaget's work, particularly the cognitive operational stages, it was believed that early elementary children could not be taught abstract concepts and that the early introduction to such concepts would lead to misconceptions and interfere with the children's later learning. Novak's work with his pupils in an elementary school suggested otherwise:

> Our early work with four lessons on plant growth (Novak, 1966) indicated that six- and seven-year-old children were capable of acquiring basic ideas regarding plant growth, development, and reproduction when well designed lessons were provided in an audio-tutorial format in regular elementary school classrooms. There seemed to be reasons to believe that children could understand basic science concepts in a substantive way that should facilitate later science concept understanding.
>
> (Novak & Musonda, 1991:118)

The 12-year longitudinal study addressed this issue since Novak affirms that young children learn more than we possibly think, and that we underestimate young children's learning abilities due to our teaching methods which do not elicit the children's knowledge and potential. Novak did not see much value in behavioural psychology or logical positivism. Therefore, he set out to delve deeper into how cognitive learning takes place.

In 1963 David Ausubel published *The Psychology of Meaningful Verbal Learning* and, being unsatisfied with the prevalent psychology of learning, Novak and his graduate students focused their research around Ausubel's major principle about learning theory: "If I had to reduce all of educational psychology to just one principle, I would say this: the most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly" (Ausubel, 1968: Epigraph). Nowadays we are more familiar with this principle in the form of 'advance organisers' which can be described as simple devices or strategies used in the introduction of a topic which enable learners to orient themselves to the topic, so that they can locate where any particular incoming information fits in and how it links with what they already know (Ausubel, 1968; Price & Nelson, 2011; Tuckman & Monetti, 2011). Other ideas from Ausubel's cognitive psychology of learning, such as progressive differentiation and integrative reconciliation were also taken into consideration.

The principle of progressive differentiation states that meaningful learning is a continuous process wherein new concepts gain greater meaning as new relationships are acquired. According to that, the most general and inclusive ideas of the discipline should be presented first, and, then, progressively differentiated in terms of detail and specificity (Novak & Gowin, 1984; Novak, 1998). The principle of integrative reconciliation states that meaningful learning is enhanced when the learner recognizes new relationships between related set of concepts or propositions (Novak & Gowin, 1984; Novak, 1998).

Therefore, several audio-tutorial science lessons were planned and interviews were conducted periodically with the same 6-8 year old children over a long period of time, by Novak and his students, to capture the children's understanding and development of particular concepts: "Each lesson was designed to build on common knowledge possessed by first and second grade children and then to build on knowledge introduced in earlier lessons in later lessons" (Novak & Musonda, 1991:147).

This research led to an accumulation of hundreds of interview tapes, and when the researchers transcribed the tapes, they "could observe that propositions used by students would usually improve in relevance, number, and quality, but it was still difficult to observe specifically how their cognitive structures were changing" (Novak, in Cañas et al., 2004:460).

Furthermore, throughout the research three ideas from Ausubel's Assimilation theory emerged:

1. New meanings are developed when built on prior concepts and propositions;
2. Cognitive structures are organised hierarchically from the more general and comprehensive concepts towards the more specific ones. (Progressive Differentiation);
3. When meaningful learning takes place, the relationship between concepts becomes more explicit and better integrated with other concepts and propositions. (Integrative Reconciliation).

(Novak in Cañas et al., 2004)

Novak and his students worked around Ausubel's theory of meaningful verbal learning which seems appropriate in making revisions to the original cognitive developmental theories. Ausubel (1968) has commonalities with Gestalt theories, was influenced by Piaget's work and introduced the concept of advance organisers, which would serve as 'ideational scaffolding'. Ausubel suggests that material must be carefully selected to serve as a link between student's present store of information and the new learning. According to Ausubel, advance organisers provide conceptual framework and also facilitate encoding. The two types of organisers identified by Ausubel were 'expository', used with unfamiliar material, and 'comparative', used to facilitate the integration of new ideas in relatively familiar material with similar, previously learned concepts. (Novak & Gowin, 1984; Gredler, 2009).

At this point Novak and his researchers stopped to reflect and discuss an efficient and practical way of displaying how the cognitive structures were changing in each case. During Novak's research, the idea to translate interview transcripts into a hierarchical structure of concepts and relationships between concepts, that is, propositions, was developed (Novak in Cañas et al., 2004). This idea evolved into the invention of a tool, now known as Concept Map. This study led the researchers to find out that the information in an interview could be easily transformed into a Concept Map. The cognitive structures represented in this way "made it relatively easy to follow specific changes in the student's knowledge structures as she/he progressed through the grades" (Novak in Cañas et al., 2004:461) since Concept Maps give a specific picture of what the child has in her/his head (Novak & Gowin, 1984; Novak, 1998; Kinchin et al., 2000; Cañas et al., 2004).

Concept Maps involve nodes usually enclosed in circles or boxes, and links, usually indicated by a connecting line between the two nodes. Novak (Novak & Gowin, 1984; Novak, 1998) defines a concept as "a perceived regularity in events or objects." The concepts are represented in nodes and their relationships to other concepts are specified by the links between them. Words on the linking line identify the relationship. Therefore, node-link-node triples in Concept Maps form propositions, which are meaningful statements about some event or object. Propositions contain two or more concepts connected with other words to form a meaningful statement (Novak & Gowin, 1984; Novak 1998; Kinchin et al., 2000).

Another characteristic of Concept Maps is that the concepts are characterized in a hierarchical manner with the most general concepts at the top of the map and the more specific or less general concepts organized below. However, in practice, the concepts in Concept Maps are not arranged in a strict hierarchy, but are arranged in a semi-hierarchical manner. "Concept Maps allow for the representation of non-hierarchical relationships or cross-links, as well as other types of non-hierarchical arrangements" (Cañas, 2003:13). The semi-hierarchical organization stems from Ausubel's idea of 'subsumption' where more general concepts include and lead to more specific and detailed concepts (Cañas, 2003).

'Cross-links' are another significant characteristic of Concept Maps. These reveal the associations between or among concepts in different segments within the Concept Map. Cross-links illustrate how a concept in one domain of knowledge represented on the map is related to a concept in another domain exposed on the same map. Cañas (2003:5) claims that "in the creation of new knowledge, cross-links often represent creative leaps on the part of the knowledge producer.” An example of a cross-link is presented in Figure 2.8 where the proposition ‘perceived regularities or patterns begin with infants’ is cross-linked to the proposition ‘creativity begins with infants’. Another example of a cross-link is the proposition ‘creativity is needed to see interrelationships’.

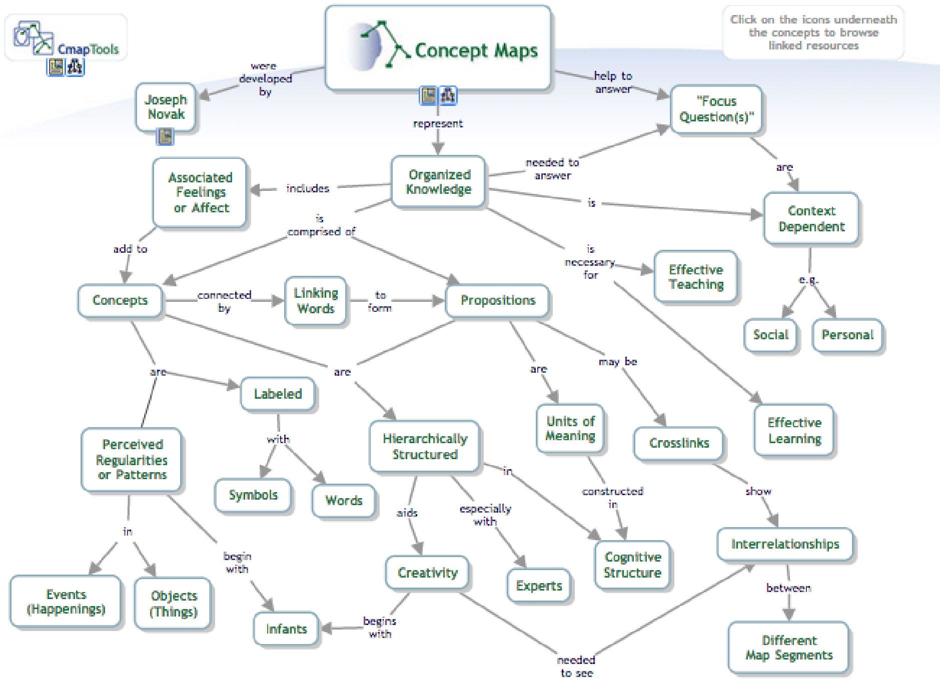

Figure 2.8: A Concept Map about Concept Maps available at www.ihmc.us

Concept Maps revolve around Novak’s meaningful learning theory. Novak, (1998:53) provides a model (see Figure 2.9) where meaningful learning is defined through three main characteristics and/or prerequisites:

1. The learners’ relevant prior knowledge.
   Learning does not occur in a vacuum and the learners bring a “personal stock of knowledge” (Jarvis, 2012) which would be relevant to the new learning.

2. Meaningful material.
   The teacher must select and present what is to be taught in a way which makes sense to the learner.

3. The learners must choose to learn meaningfully.
   Very often, for some reason or other, learners choose to learn by rote. They can begin their learning process through memorizing a concept, “however, meaningful learning requires further effort; the learner must choose to relate the concepts and proposition(s) of the definition in some substantive way to what relevant knowledge already exists in the learner’s cognitive structure” (Novak, 1998:56).

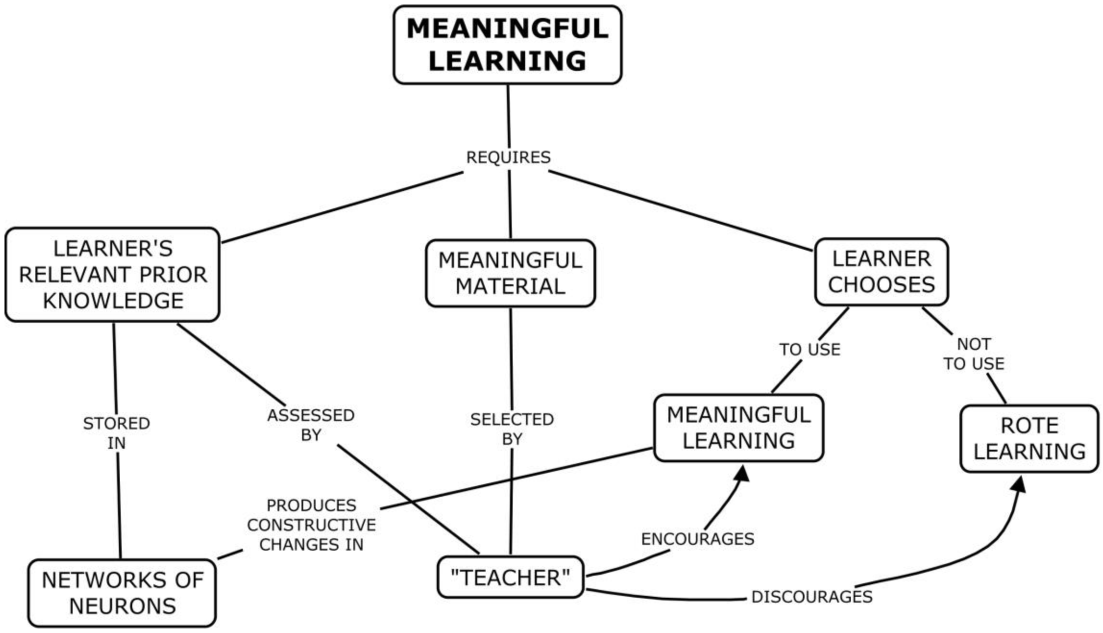

Figure 2.9: The three requirements for meaningful learning as presented in Novak, 1998:53

Very often, in the literature, one finds that Concept Maps are confused with Buzan's Mind Maps which originated in the late 1960s (see Figure 2.10) (Åhlberg, 2002b; Cañas, 2003). The underlying principle in Mind Maps is that the brain works associatively as well as linearly. Mind Maps are a graphic technique where associated thoughts are represented, often assisted with the use of colour and images, as a web-like graph since "they all have a natural structure that radiates from the centre" (Buzan, 2005:7). Cañas (2003:90) argues that "the Mind Map structure offers little more than a circular-arranged list of related or grouped ideas."

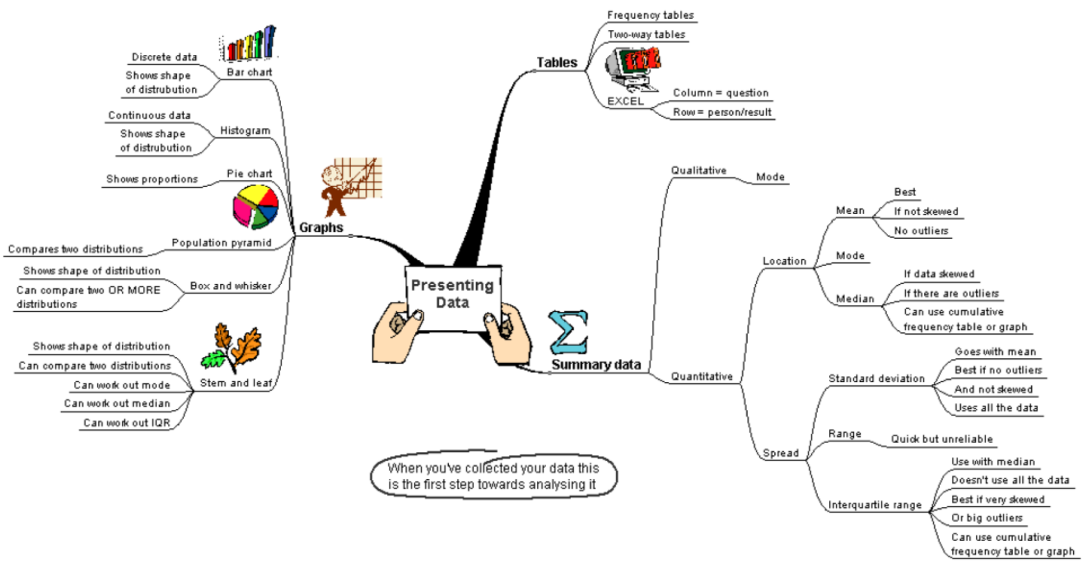

Figure 2.10: A Mind Map as presented in Cañas, 2003:90

If one takes a look at Figure 2.10, one may observe that although there may be hierarchical relations and levels of branching, yet the linking lines are unlabelled and, therefore, they do not specify the relationship or connection among ideas presented. Åhlberg and Ahoranta (2002) assert that in a Concept Map, every concept has just one representation whereas in a Mind Map the same concept may be presented several times. Buzan and Buzan (1993) propose that Mind Mapping is a strategy that encourages 'deep' learning. However, this stance stands to scrutiny since if one views the 'deep' approach to learning as "a qualitative change in one's way of understanding some aspect of reality" (Marton, 1983:291) or as a strategy for students to reflect critically and relate their ideas to prior knowledge and experiences (Entwistle & Ramsden, 1983), then Mind Maps do not reveal this kind of development or change. They rather present what Entwistle (1988) refers to as "pieces of disconnected information" which in turn lead to a surface approach of learning. Likewise, Brown (2006:9) suggests that "surface approach to learning involves learners applying teachable skills or strategies such as underlining, mind mapping or mnemonics." However, both surface and deep approaches may be present during learning (Beattie et al., 1997) therefore one may use Mind Maps as a starting point which would then be developed into a Concept Map.

In a nutshell, Concept Maps are defined and distinguished by the following characteristics (Cañas, 2003; Cañas et al., 2004):

1. Their theoretical basis in Ausubel's Assimilation Learning Theory and constructivist epistemology.
2. Their semi-hierarchical organisation
3. The use of unconstrained and meaningful linking phrases
4. The way concepts are defined

Åhlberg proposed an approach towards learning how to construct a good concept map by using an analogy of islands and bridges:

> Concepts are like islands and links between the concepts are like bridges. One may move from any concept-island to another by naming the link-bridge in a meaningful proposition/sentence/statement about the world. All links are arrows, and they are like traffic signs showing the direction of reading/moving from one concept to another.
>
> (Åhlberg & Ahoranta, 2002:121-122)

Åhlberg's work has been distinguished in Finland and elsewhere for an improved version of Concept Maps. The difference lies in the way Concept Maps are constructed but not in the underlying principles. According to Åhlberg, the major improvement lies in the fact that improved Concept Maps are used more creatively and flexibly than either in Novak & Gowin (1984) or in Novak (1998) does (Åhlberg, 2004b).

From the above literature one may deduce that constructing Concept Maps is a very active and creative process. They are an excellent exercise in promoting creativity, thinking skills, problem-solving and decision making skills. Cañas, (2003:7) states that "learners struggling to create good Concept Maps are themselves engaged in a creative process and this can be challenging to many, especially those who have spent most of their life learning by rote." Consequently, Concept Maps may be considered as a tool that challenges rote learning.

The sections above discussed how Vee Heuristics and Concept Mapping are two metacognitive tools that expose the different ways in which students arrive to new meaningful knowledge construction. The next section will discuss the Let Me Learn process which gives an explanation as to why and how students respond to incoming information in the way they do.

2.5 Let Me Learn®

Let Me Learn (LML) has its theoretical basis in the Interactive Learning Model developed by Johnston (1996) (see Figure 2.11) and is based upon research conducted in cognitive science, brain science and multiple intelligences (Allport, 1961; Gardner, 1983; Bruer, 1993; Keefe & Ferrell, 1990; Snow & Jackson, 1992; Johnston, 1996; Sternberg, 1996). The Interactive Learning Model proposes that learning is a process occurring through the use of three mental processes: cognition, conation and affectation and that these processes are the internal operations of our learning patterns namely: Sequential, Precise, Technical and Confluent, and the degree to which each pattern is used varies from person to person. To measure the degree to which each learner uses each of these patterns, Johnston and Dainton (2005) developed the Learning Connections Inventory (LCI) which has withstood empirical and theoretical testing for more than 20 years in different countries around the world. The LCI scores reveal whether one uses a learning pattern at a "Use First" level, "Use as Needed" level or seeks to avoid it altogether (see Appendix A, Figure A.7 p.262). Therefore, the different learning patterns are captured through the Learning Connections Inventory (LCI). The results revealed on the score sheet of the LCI do not categorize or place a learner into one quadrant but, instead, they emphasize that every learner possesses each of the four different learning patterns and uses each of these in concert, and to varying degrees, along a continuum. The learners are then equipped with a lexicon of learning terms and metacognitive strategies to be used with intention for successful learning to take place.

Figure 2.11: The Interactive Learning Model (Johnston, 1998, 2010)

Johnston refers to these patterns as our "universal, person-specific patterns" (Johnston, 2010). The point to be emphasised here is that these four learning patterns work as a team. That is to say we use all these patterns in concert, but to varying degrees. Therefore, it would not be accurate to say that a learner is, for instance, a 'confluent learner' or a 'sequential learner'. More exactly, a learner is a combination of these patterns, where she/he may use one or more of them predominantly, or one or more of them as needed, or, a learner may avoid one or more of them. Rather than categorising or placing a learner into one single quadrant, Let Me Learn emphasizes that every learner uses all of these learning patterns in tandem, but to varying degrees.

What makes LML system work is the fact that the difference in growth of learners and teachers alike who are involved in this system, as opposed to those learners and teachers who are not, could be measured (see Appendix A p.278). LML is based on the assumption that taking control of how one learns is powerful and positive (Flavell, 2000) and it provides a lexicon of learning terms and teaches metacognitive/reflective skills (Johnston, 1998; Osterman & Kottkamp, 2004). It helps learners take responsibility for making learning work for them by using carefully developed activities including a student designed, metacognitively-driven strategy card that guides the learner through various types of learning tasks. In this way, the learner is not only informed but also equipped to use the information with intention so as to succeed (see Appendix A.9 p.271-275).

2.6 Integrating metacognitive tools: a constructivist approach.

2.6.1 What is constructivism?

The term 'constructivism' refers to the idea that learners construct knowledge for themselves. Each learner constructs meaning individually and socially as he or she learns (Gage & Berliner, 1998; Twomey Fosnot 2005). Prosser and Trigwell (1999:13) describe this constructive perspective as the process of knowledge construction which is "driven internally through processes of assimilation (integrating new knowledge into existing knowledge structures) and accommodation (changing knowledge structures)."

Likewise, Twomey Fosnot (2005: Preface) describes constructivism as "a theory about knowledge and learning; it describes both what 'knowing' is and how one 'comes to know'." More importantly, Twomey Fosnot argues that:

> learning from this perspective is viewed as a self-regulatory process of struggling with the conflict between existing personal models of the world and discrepant new insights, constructing new representations and models of reality as a human meaning-making venture with culturally developed tools and symbols, and further negotiating such meaning through cooperative social activity, discourse and debate in communities of practice.

Therefore, constructivism is based on the premise that each learner responds to and interprets incoming information differently depending on his/her mental operations and prior experience. Consequently, von Glasersfeld (2005) suggests that "knowledge, then, could be treated not as a more or less accurate representation of external things, situations, and events, but rather as a mapping of actions and conceptual operations that had proven viable in the knowing subject's experience." (von Glasersfeld, 2005: 4).

Similarly, Kincheloe (2005:4) states that "the knowledge of the classroom is constructed where the students' personal experience intersects with academic knowledge." The constructivist teacher must be skilled in fostering this synthesis of personal experience and academic knowledge. Jarvis (2002) refers to this as the teachers' 'artistry'. Kincheloe (2005) also reveals that "the purpose of education in this critical constructivist process is not to transmit a body of validated truths to students for memorization. Instead, a central role of schooling involves engaging students in the knowledge production process" (Kincheloe, 2005:3). As a result, constructivism is based on the assumption that knowledge is not independent of the learner but, on the contrary, knowledge is constructed by the learner through internal mental processes during learning; it is rather a personal and social construction of meaning. Evidently, constructivism dismisses the passive role of learners and empowers learners' participation in reflecting, analyzing, interpreting and constructing knowledge emerging from prior experiences and different settings.

2.6.1.1 The emergence of constructivism.

Constructivism stems from the field of cognitive science, particularly the work of Jean Piaget and Lev Vygotsky (Twomey Fosnot, 2005). Piaget's constructivism is based on his view of the psychological development of students. In a synthesis of his educational thoughts, Piaget (1973) called for teachers to understand the stages in the development of the student's mind. Piaget believed that the fundamental basis of learning is discovery and that understanding is built up step by step through active involvement (see p. 30).

Lev Vygotsky, is also important to constructivism. Like Piaget, he stresses that students create their own concepts, but opposes Piaget when he claims that the students' prior concepts are interwoven and influenced as the student works out his/her own ideas from interacting with the outside world and as they are presented to him/her by adults (see p. 31). John Dewey and Jerome Bruner's work may also be considered as roots for constructivism (Twomey Fosnot, 2005). For Dewey, education depended on action. Knowledge emerged only from a situation where the learners draw it out of experiences that had meaning and importance to them. Furthermore, Dewey claims that accumulated knowledge must meet the students' experience (Dewey, 1916).

Bruner (1996), like Dewey, views learning as an active process in which learners construct new ideas or concepts based upon their current and prior knowledge. The learner chooses and permutes the knowledge, constructs hypotheses, makes decisions and, while performing these, he relies on his cognitive structuring. Similarly, Paolo Freire (1970), like Bruner and Dewey, declares that learning must start from the experiences and the voices of students themselves. Education is based on a two-way communication where the end result is negotiation and dialogue. Freire takes this process to a different level where he states that this dialogical process leads to a process of conscientisation. Freire has defined conscientisation as the central concept in his theory of learning and education. It is the process by which learners "achieve a deepening awareness of both the sociocultural reality which shapes their lives and of their capacity to transform that reality through action upon it." (Freire, 1970:27). Freire states that, through a process of conscientisation, learners engage in action to bring about social change: "increasingly posed with problems relating to themselves in the world and with the world, they will feel increasingly challenged and obliged to respond to that challenge" (Freire, 1970:62).

Émile is a novel and is considered to be Rousseau's most significant work in education. The focus of *Émile* is upon the individual tuition of a boy in line with principles of "natural education". Rousseau's writings emphasized the importance of developing ideas for ourselves and of making sense of the world in our own way. People must be encouraged to reason their way through to their own conclusion without relying on the teacher's authority. So, instead of being taught what to think Émile is encouraged to draw his own conclusions from his own experiences (Wokler, 1996). "Studenthood has ways of seeing, thinking and feeling peculiar to itself: nothing can be more foolish than to seek to substitute our ways for them" (Boyd, 1956:38-39). It can be argued that Rousseau made the first comprehensive attempt to describe a system of education according to what he saw as 'nature'. It certainly stresses a concern for the person of the learner. Rousseau suggests that the momentum for learning was provided by the growth of the person and what the educator needed to do was to facilitate opportunities for learning.

The central theme in Rousseau's writings is that, for education to be effective in the making of good human beings and, through them, a good society, it must be student-centred. Every student is different from every other and, therefore, they must be educated differently. Rousseau places emphasis on the learners' experiences but also on the learners' human nature and the teacher should take into account both these factors in order to help the learners develop themselves through education. "Plants are fashioned by cultivation, men by education. … This education comes to us from nature, from men, or things … the three educations must work together for a perfect result" (Rousseau, 1956:11-12). Rousseau's work is closely related to the constructivist perspective as well as to Socrates' dialectic method. Even in ancient Greece, Socrates argued that education was about drawing out what was already within the student. The dialectic method would always start from the most obvious aspects of any problem, and then one sees Socrates pretending to be ignorant about a subject in order to elicit from the other people their fullest possible knowledge about the problem through a process of conversation or dialogue (Hamilton & Cairns, 1961). Socrates considered this method of dialectic a kind of 'intellectual midwifery' (Stumpf & Fieser, 2003).

2.6.1.2 Common features in constructivism

Gage and Berliner (1998) and Twomey Fosnot (2005) claim that the common features in constructivism include prior knowledge and experiences, conceptual change, metacognition and the use of scaffolding in promoting students as the primary agents in their own learning yielding to meaningful retention. Metacognition refers to "knowledge about and awareness of one's own thinking and learning and the use of strategies to guide, monitor, and redirect one's thinking and learning" (Gredler, 2009:446). It is intrapersonal communication where time is given to quietly think and reflect on what one is learning (Vanhear & Borg, 2000). Similarly, Booth (2011:18) states that "metacognition is like an expert voice in your head providing insight into what is happening." Gage and Berliner (1998) state that metacognition during learning is of two kinds: thoughts about what we know and thoughts about regulating how we go about learning.

Biggs (1987) and Hartman (2001) suggest that for students and teachers to be metacognitive they need strategic planning in being aware of the information, skills and strategies one has, when and why to use them and how to use them in relation to task demands. Consequently, the learner is empowered to embark upon a meta-learning journey (Biggs, 1987; Watkins 2001). There are two components that appear to be involved in meta-learning: **awareness** of the learning processes one may use and **control** in applying them appropriately and efficiently (Biggs, 1987).

Behaviourist models emphasise the multistage model of memory where practising past tasks produces over learning which results in resistance to extinction (Vanhear & Borg, 2000:10). This model clearly promotes rote learning; however, research in this field reveals that the cognitive key to retention is meaningfulness (Freire, 1970; Novak & Gowin, 1984; McLaren,1989; Holt, 1995). Zajda (2006:96) claims that "the overwhelming need for any learner is meaningfulness and the brain actively selects, processes and designs patterns of understanding." Therefore, one of the ways in which rote learning is challenged is through metacognitive instruction (Novak, 1998; Bruer, 1993). Metacognition challenges the transmissive views of learning and teaching held by certain teachers and the passive views of the role of the learners (Vanhear, 2008). Evans and Nation (2000:52) argue that:

> the incorporation of the learner's ownership of knowledge and the learner's voice is essential for them to construct knowledge. This is to aid in the production of active, reflective and ampliative learners, who not only generate mental models of what they learn, but also control their internal strategies of learning for meaningful learning to occur.

Metacognition challenges rote learning and it puts emphasis on meaningfulness as the cognitive key to retention (Novak, 1998; Bruer, 1993; Georghiades, 2000). "Metacognitive tools are helpful, but they are neither a 'sure cure' nor a 'quick fix'" (Novak, 1989:235). Georghiades (2000:131) reveals that young students who received metacognitive instruction performed better as they "gradually engaged more fully in classroom discussions, and seemed to remember more taught material (e.g. terms, definitions, examples, applications) from previous lessons."

Holt (1995) contends that students do not retain knowledge which is not relevant to their lives. This is also brought out through the work of Dewey, Bruner and Freire as discussed above. Consequently, prior knowledge and experiences cannot be disregarded, and are highlighted in the constructive perspective. Bruer (1993:28) argues that pre-existing structures, which psychologists term schemas, affect how one processes and interprets incoming information, and "school instruction that ignores the influence of pre-existing knowledge on learning can be highly ineffective." Thus, constructivist theory leads us to acknowledge that there is no such thing as knowledge 'out there' but knowledge for the learner "exists only in the learner's ability to construe and re-construe the meaning of an experience in his or her own terms" (Mezirow, 1991:20). This kind of process where the learner is cognitively active during the learning process is the fundamental notion of constructivist teaching. Constructivism dismisses the passive role of learners and encourages learners' participation in reflecting, analysing, interpreting and constructing knowledge emerging from different educational settings.

2.6.1.3 Concept Maps, Vee Heuristics and the Let Me Learn System as metacognitive tools leading to a constructivist approach.

One of the key ideas in Concept Mapping and Vee Heuristics is that they are grounded in theories of how people learn. (Novak & Gowin, 1984; Novak, 1989; Gowin & Alvarez, 2005). When using these two tools in pedagogy, one would be teaching a process which promotes a constructivist perspective since these two tools facilitate the learners' construction of their own personal learning. Throughout this whole process, the responsibility is shifting from the teacher to the learner; the teacher is there just to facilitate and mediate the process.

Research illustrates that Concept Maps and Vee Heuristics are highly effective metacognitive tools (Novak & Gowin, 1984; Novak, 1998; Georghiades, 2000; Åhlberg, 2002a, 2002b; Åhlberg & Ahoranta, 2004; Cañas et al., 2004, 2006, 2008, 2010; Mintzes et al., 2005). Ramsden (2003:6) refers to learning as “changing the ways in which learners understand, or experience, or conceptualise the world around them. The ‘world around them’ includes the concepts and methods that are characteristic of the field of learning in which they are studying”. Similarly, Mezirow (1996:162) defines learning as a meaning-making activity which “is understood as the process of using prior interpretation to construe a new or a revised interpretation of the meaning of one’s experience in order to guide future action.” Following this premise both Concept Maps and Vee Heuristics are highly effective in capturing prior knowledge and how this is developed to construct new knowledge (Novak & Gowin,1984; Thompson & Mintzes, 2002, Novak, 2010). Concept Maps “provide a kind of visual road map” (Novak, 1984:15) revealing prior knowledge to both the teacher and the student and how they are developing their understanding in their cognitive structure leading to a mutual understanding. Similarly, Gowin and Alvarez, (2005:7) claim that “Concept maps externalize a student’s thinking. Maps provide a shareable document for teachers and students to negotiate meaning”. This leads us to two major terms in constructivism: metacognition and scaffolding (or Vygotsky’s Zone of Proximal Development see p.31). Brooks and Brooks (1999) state that when teachers understand what students think about concepts or events under study, they are better able to formulate lessons and differentiate instruction based on the learners’ needs.

When revisiting the literature reviewed previously relating to Vee Heurisitics and Concept Maps, one may conclude that these tools originated from a constructivist perspective theory of learning which holds that learners construct their own knowledge as opposed to the preceding dominant belief of knowledge as something that is acquired through direct transfer and rote learning. Gowin and Alvarez (2005: Preface) sum this up as follows:

> Our fundamental assumption is that knowledge is not absolute, but rather it is dependent upon the concepts, theories, and methodologies by which we view the world. To learn meaningfully, individuals relate new knowledge to relevant concepts and propositions they already know. The V diagram aids learners in this thinking process by acting as a metacognitive tool that requires users to self-monitor their progress by making explicit connections between previously learned and newly acquired information.

Similarly Kinchin (2006:79) claims that “Concept Mapping is explicitly embedded within a constructivist approach to teaching with the aim of facilitating meaningful learning.” One can therefore say that Ausubel was at the forefront of constructivist thought, since constructivists hold that prior knowledge is used as a framework to learn new knowledge. Furthermore, how we think influences how and what we learn. Both Concept Maps and Vee Heuristics identify our prior knowledge, the way we think and the way we see relationships within knowledge, and this is certainly highlighted in constructivism.

Constructivism also views learners as critical reflectors in order to develop decision making and problem solving skills whilst also empowering them to reflect and understand how they can learn most effectively. Literature in the field of Concept Mapping and Vee Heuristics, as previously discussed, reveals that these two metacognitive tools lend themselves to critical reflection (Novak & Gowin, 1984; Novak, 1998; Georghiades, 2000; Åhlberg, 2002b; Åhlberg & Ahoranta, 2004, Cañas et al., 2004, 2006, 2008, 2010, 2012). Reflective time allows students to communicate their ideas which help them to consolidate their learning, “deep understanding occurs when the presence of new information prompts the emergence or enhancement of cognitive structures that enable us to rethink our prior ideas” (Brooks & Brooks, 1993:15). Similarly, Novak argues that only meaningful learning facilitates new learning. Furthermore, Novak and Gowin (1984), Novak (1998) and Gowin and Alvarez (2005) maintain that Concept Maps and Vee Heuristics are effective tools that help the learner to organize knowledge that is destined for long term memory, while they also serve as a form of mental scaffolds that help learners to think more critically and creatively.

The LML System is also founded on a constructivist perspective (Dawkins et al., 2010) since it empowers learners to discover who they are as learners and then suggests strategies to enable them to be autonomously successful in different learning settings. Through a self-regulated process, this learning system helps learners to take responsibility for making learning work for them by using carefully developed activities including a student designed, metacognitively-driven strategy card that guides learners through various types of learning tasks (See Appendix A.9, Figure A.11 p.275). Johnston (2010:164) refers to metacognition as “our internal talk” (sometimes referred to also as internal chatter) - “the voice of our Directional Learning Processes telling, arguing, and negotiating how to proceed, how to achieve, and how to respond by using personal strategies to reach your destination.” Johnston regards metacognition as an active process where the learners’ mental processes are continuously monitoring how well they are progressing and ensuring whether they are on the right track or not in order to achieve greater success in a particular task. In LML lexicon this active mental process is referred to as the Metacognitive Drill and it assigns seven terms to explain what the learner is going through during an extant learning event. These terms are (1) Mull, (2) Connect, (3) Rehearse, (4) Express, (5) Assess, (6) Reflect, and (7) Revisit (Johnston, 2010: 65-72; See Appendix A.9 Figure A.10 and Table A.9 p.273).

2.7 Learning outcomes leading to a deep approach towards learning

As discussed above, research in the past 40 years or so, has seen the learner become of central importance in the teaching and learning interaction (Marton & Säljö, 1976; Barr & Tag,1995; Marton & Booth, 1997; Prosser & Trigwell, 1999; Jarvis, 2006a, 2006b; Biggs & Tang, 2011). This has led to a redefinition of teaching as the facilitation of student learning (Novak & Gowin, 1984; Novak, 1989, 1998; Ellington & Earl, 1999; Brockbank & McGill, 2011). Consequently course goals in terms of learning outcomes have been redefined in order to foster deep learning (Moon, 2002; Kennedy, 2009; Biggs & Tang, 2011).

Two of the best known approaches that have informed prevalent literature about teaching and learning in Higher Education are the deep and surface approaches (Entwistle & Ramsden, 1983; Biggs, 1987; Marton & Säljö, 1997). The distinction between these two approaches emerged through the works of Marton and Säljö (1984) who reveal the value of the analysis of learning at two levels of specificity – surface and deep. Higher Education in particular, in various countries, calls for a greater degree of deep learning rather than surface learning (Beattie et al., 1997). Mathieson (2015:66) defines deep learning as that approach to learning where "students' intention is to engage meaningfully with the task with the appropriate background knowledge and the ability to focus at a high conceptual level." Therefore, deep learning involves meaningful learning based on the desire to understand, leading to conceptual change. On the other hand, Mathieson (2015:66) explains that the surface learning approach is where "students' intention is to get the task done with the minimum of effort by concentrating on facts and details, but with no comprehension of the underlying themes." Therefore, surface learning involves rote learning of content leading to superficial learning.

Deep and surface approaches to learning were similarly defined by Prosser and Trigwell, 1999; Ramsden, 2003; Race, 2010 and Hermida, 2015. Race (2010) suggests that besides deep and surface learning there is also 'strategic learning' which occurs when the student chooses what to study well just to get a good grade in an exam. This is regarded as 'learning for the exam'. In the strategic learning approach the student makes "informed choices about when to be a deep learner, and when to be a surface learner. It could be viewed as investing more in what is important to learn, and less in what is less important to learn" (Race, 2010:66). Prosser and Trigwell (1999) suggest that in Higher Education, those lecturers, who embrace a student-focused approach to teaching and learning, promote a deep approach to study among their students. Nevertheless, Beattie et al. (1997) reveal a dichotomy in the terms 'deep' and 'surface' learning and assert that there is a tendency of oversimplifying their complexity and neglect key aspects. Consequently, Beattie et al.'s paper traces the evolution of the concepts of 'deep' and 'surface' through the work of four research groups as summarised in Table 2.4.

Research Group	Lead Researcher	Research Study	Study Approaches
The Lancaster Group	Entwistle	Project 1 Identified student attributes (such as personality, motivational and study variables) which could be used to predict academic success.	Fixed, pre-determined study approaches
The Australian Group	Biggs	Presented evidence that approaches to learning vary according to students' capabilities for metalearning which is related to individual student differences such as general ability & locus of control. The presage factors which include personal characteristics and institutional characteristics affect academic performance depending on the student motives for learning and the strategies adopted for learning.	Flexible; Vary on students' motives and strategies
The Swedish Group	Marton	Emphasise the intention of the student , that is to say, what a student intends to get out of learning determines whether a deep or surface approach will be undertaken. This in turn will determine the level of performance.	Flexible; vary on students' intention (motives) and approach (strategy).
The Richmond Group	Pask	Investigate how students learn complex new fields of knowledge by adopting learning strategies (serialist, holist) depending on their learning style (operation, comprehension, versatile).	Flexible; vary on students' learning styles.
The Lancaster Group	Entwistle	Project 2 Here, the study approach no longer viewed as an inherent student characteristics fixed and determined by individual traits.	A widely, general model where metalearning acts as the dynamic link between student, task & outcome.

Table 2.4: Summary of the Four Research Groups as presented in Beattie et al. (1997)

From Beattie et al.'s research, one can deduce that the crucial factor affecting the students' approaches to learning is meaningfulness. Furthermore, meaningfulness is achieved through metacognition and metalearning (Novak & Gowin, 1984; Bruer, 1993; Novak, 1998; Hartman, 2001; Slavin, 2006; Zajda, 2006). Therefore, understanding a students' preferred way of learning so as to make learning relevant is crucial since it is likely to affect the students' approach towards learning. Some students habitually memorise facts; others study for the 'big' ideas; still others do both in varying degrees. Furthermore, the 'big' ideas can help to organise and make facts meaningful through deductive reasoning even though they can be induced from the facts themselves. Similarly, research conducted on scripts by Anderson (1993, 2013), indicates that individuals tend to name the same major events when asked to state the important events in an episode such as going to a restaurant. However, once learned, they tend to operate below the individual's level of conscious awareness, that is, as tacit knowledge. Tacit knowledge in information-processing theory is the knowledge that typically operates below the level of conscious awareness (Gredler, 2009). Winch (2010:117) defines tacit knowledge as that "knowledge that is not articulated, or cannot be articulated." However, he also argues that tacit knowledge is "an ambiguous phrase" since it may be presented in a variety of forms such as propositional knowledge, practical knowledge or knowledge by acquaintance (see Winch, 2010: 117-134 for a detailed discussion of the significant varieties of tacit knowledge).

Ramsden, (2003) and Biggs and Tang, (2011) observe that higher order learning outcomes are more likely to encourage students to take a deep approach to learning in the subject under study. Consequently, as a result of all these findings future definition of quality teaching and learning not only depends on how each individual student is experiencing learning but also on the learning outcomes (Ramsden, 2003; Biggs & Tang, 2011; EACEA/Eurydice, 2015). Similarly, Bach et al. (2007:80) suggest that Learning Outcomes "are usually considered to be a crucial part of the development of twenty-first century approaches to higher education." The Bologna Process has today moved towards a learning outcomes framework where all EU member states have to write their courses and programmes in terms of learning outcomes (Kennedy, 2009). The Bucharest Communiqué (2012) highlights the importance of a meaningful implementation of learning outcomes and reiterates that the development, understanding and practical use of learning outcomes is crucial in the European Higher Education Area.

The literature shows myriad of definitions about Learning Outcomes which are quite similar. A common good working definition of a learning outcome would be that "a learning outcome is a statement of what a student should know, understand and/or be able to demonstrate after completion of a learning process" (Kennedy, 2009:126; Bernholt et al., 2012:111). An interesting definition is put forward by Watson (2002:208) where he defines a learning outcome as "something that students can do now that they could not do previously … a change in people as a result of a learning experience.” There seems to be a confusion between aims, objectives and learning outcomes. Aims are more like broad purposes, “they are general statements of educational intent that give some indication of the overall purpose, or desired goal, of a course” (Ellington & Earl, 1999:28). Likewise, Froment (2006:6) explains that aims “indicate the general content, direction and intentions behind the module from the designer/teacher viewpoint.” Moon (2002:62) states that “aims are more about teaching and the management of learning and learning outcomes concern the learner learning.” The term ‘objectives’ tends to complicate this scenario since it is very difficult to distinguish between ‘objectives’ and ‘learning outcomes’. This is due to the fact that many times these are used synonymously and objectives tend to be written either in terms of teaching intention or expected learning. As a result, ‘objectives’ may appear to be aim statements or learning outcomes statements. Moon (2002:62) reveals that “this general lack of agreement as to the format of objectives is a complication and justifies the abandonment of the use of the term ‘objectives’ in the description of modules or programmes.” This is also noted by Kennedy (2009).

One popular way of constructing learning outcomes is by using the structure as presented in Bloom’s taxonomy (Coats, 2000; Nicholls, 2002; Kennedy, 2009; Bernholt et al., 2012). This has provided an easy and quick recipe for teachers to follow when writing learning outcomes. However, Hussey and Smith (2002) have criticised approaches to writing learning outcomes that rely on generic level descriptors such as those based on Bloom’s Taxonomy. Allan (1996) argues that learning outcomes limit the students’ learning experience or focus on minimal learning. Ecclestone (1999:29) points out that “if unchecked, there is a real danger that uncritical acceptance of increasingly prescriptive, standardised outcomes will create cynical, instrumental attitudes to learning in teachers and students alike and remove critical dimensions of student centeredness from higher education.”

In the literature, there seems to be one common criticism proposed by various authors (Eisner, 2000; Wisdom, 2001; Hussey & Smith, 2002, 2003, 2008) that although learning outcomes may be added value to educational processes since they bring more clarity to the learning process, yet, they will be counterproductive if they serve as fixed prescriptions or recipes or, as Eisner (2000:344) puts it, “a uniformed army of young adolescents all marching to the same drummer.” Neuroscience tells us that our brains are “as unique as our fingerprints” (Meyer et al., 2014). Therefore, having fixed learning outcomes would not be responding effectively to the reality of today’s diverse classroom. One should not regard the learning outcomes as a once and for all but, as Wisdom (2001) points out, they should indicate an iterative process that involves both learners and teachers as active participants in their development. The use of learning outcomes can add value to the educational process, but, only if they are used in a flexible way to guide rather than dictate student learning (Hussey & Smith, 2002, 2003, 2008).

If learning outcomes are used rigidly they will limit the unplanned outcomes or what Hussey and Smith (2002, 2003, 2008) refer to as ‘emergent outcomes’ that tend to arise during learning moments. These ‘emergent outcomes’ are extremely important during the educational process and promote deep learning (Ramsden, 2003; Biggs & Tang, 2011). This very much depends on the teacher and how adept he/she is in recognising and tolerating these unintended outcomes, that emerge as the learners engage with the course and relate it to their own experience, and in pushing the students over threshold concepts to encourage creativity in thinking. This is what Schön (1983) terms ‘reflection-in-action’. “Best practices” in teaching and learning in Higher Education according to McAlpine et al. (1999) are those that monitor for student cues that indicate engagement and comprehension. For some lecturers this may be an automated process which needs to be made explicit and it is “an important strategy in developing teaching expertise” (McAlpine et al., 1999:138).

In responding to the theoretical framework on which this research is constructed, learning outcomes should move beyond the traditional view of focusing on knowledge and skills only to, include affective factors such as developing enthusiasm for learning or the ability to self-regulate (Meyer et al., 2014). This notion is also observed by Hussey and Smith (2003:367) that: “accepting that student motivation is an essential element in learning, we propose that those who teach should begin to reclaim learning outcomes and begin to frame them more broadly and flexibly, to allow for demonstrations and expressions of appreciation, enjoyment and even pleasure.”

Furthermore, Darling-Hammond’s (2000) findings from her evidence-based research about the effects of quality teaching on student outcomes reveal that the quality of teaching and teacher education seem to be more strongly related to student achievement and outcomes sought than other variables such as class size, teachers’ salaries or students’ background. In this premise, Hattie (2003) provides some of the most compelling evidence for the importance of quality teaching through a recent meta-analytic synthesis of the relevant evidence-based research which was drawn from an extensive review of literature and a synthesis of over half a million studies. This valuable work identifies the greatest source of variance that can make the difference in a classroom as the teacher and excellence in teaching is the single most powerful influence on students' achievement (Hattie, 2003:3-4). Hattie's (2003) percentages of achievement variance are represented in Figure 2.12. This was also asserted by Rowe et al. (1993) where on the basis of their findings it was argued that effective schools were only effective to the extent that they had effective teachers. Moreover, Hattie distinguishes between expert and experienced teachers (see Figure 2.13) and identifies one of the five major dimensions in an excellent teacher as being that "expert teachers can attend to affective attributes" (Hattie, 2003:5) by having high respect for their students and by being passionate about teaching and learning.

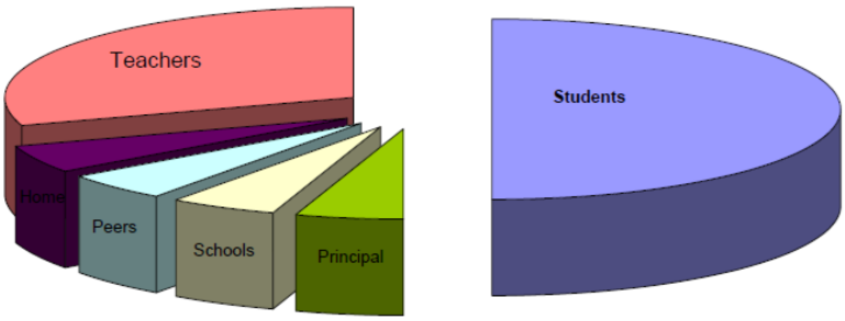

Figure 2.12: Percentage of Achievement Variance (Hattie, 2003:3)

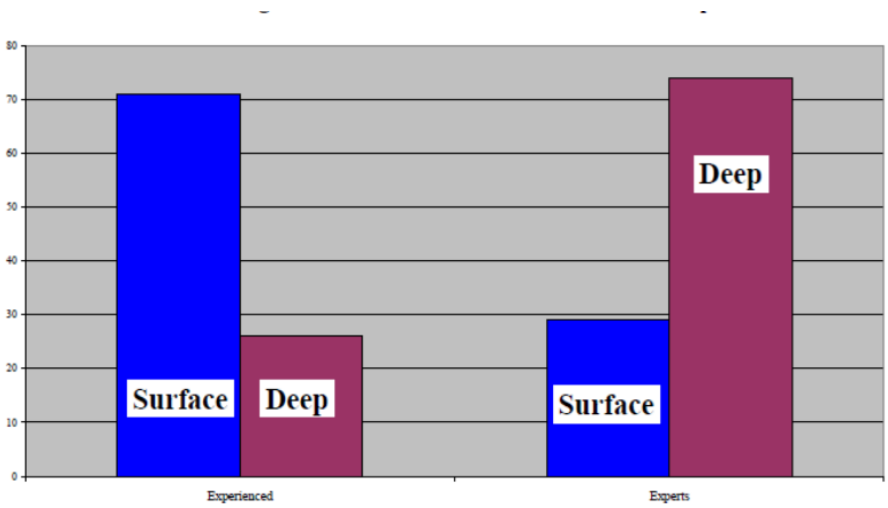

Figure 2.13: Percentage of Student Work classified as Surface or Deep (Hattie, 2003:3)

CHAPTER 3

RESEARCH DESIGN

3.1 Introduction

This chapter explains the methodological foundation of this study and justifies the strategies, tools and methods used to address the research questions in order to achieve the study's objectives. The objectives set up and exhibited in Chapter One (p.7) provide a road map for the entire research process. These objectives guide the whole study and determine the methodological position, research design, methods, research tools and procedures adopted in this research.

On the basis of the theoretical background presented in Chapter Two and the objectives set out in Chapter One, the following major research question was formulated:

"In what ways can teacher-student interaction influence meaningful learning when mediated by metacognitive tools?"

However, after analysing the data collected through Action Research to respond to the above research question, a secondary research question emerged (see Chapter Five).

"How do the tools used get teachers to become reflective practitioners so as to enhance students' meaningful learning?"

3.2 Methodological stance embedded within a framework

Historically, educational research was either qualitative or quantitative (Guba & Lincoln, 1989; Creswell & Plano Clark, 2011; Denzin & Lincoln, 2011b; Creswell, 2014) with the quantitative approach being the most dominant and the qualitative approach emerging as an alternative approach in the late 20th century (Guba & Lincoln, 1989; Teddlie & Tashakkori, 2009). These two dominant methodological approaches (see Table 3.1) differed mostly in their philosophical assumptions about:

- ***Ontology*** **–** the nature of reality
- ***Epistemology*** **–** the nature of knowledge
- ***Methods & Methodology*** **–** research strategies and procedures
- ***Axiology*** **–** the role of values
- ***Rhetoric*** **–** the use of language.

(Guba & Lincoln, 1989; Teddlie & Tashakkori, 2009; Creswell & Plano Clark, 2011; Denzin & Lincoln, 2011a; Bryman, 2012; Creswell, 2014).

Quantitative	Qualitative
Numbers	Words
Point of view of researcher	Points of view of participants
Researcher distant	Researcher close
Theory testing	Theory emergent
Static	Process
Structured	Unstructured
Generalisation	Contextual understanding
Hard, reliable data	Rich, deep data
Macro	Micro
Behaviour	Meaning
Artificial settings	Natural settings

Table 3.1: Some common contrasts between quantitative and qualitative research approaches (Bryman, 2012:48)

Teddlie and Tashakkori (2009:5) define quantitative methodologies as “techniques associated with the gathering, analysis, interpretation, and presentation of numerical information.” This approach dominated research for much of the 20th century and is often associated with positivist/postpositivist paradigm. Qualitative research methods emerged mainly at the end of the 20th century and they are associated with a constructivist (or interpretivist) paradigm and its variants. Teddlie and Tashakkori (2009:6) define qualitative methods as “the techniques associated with the gathering, analysis, interpretation and presentation of narrative information.” The debates between the proponents of these two different approaches have been so extensive that some authors have called this period during the last decades as an era of “paradigm wars” (Gage, 1989; Hammersley, 1992) or “paradigm debate” (Creswell & Plano Clark, 2011).

Authors in this field (Hammersley, 1993; Johnson & Onwuegbuzie, 2004; Cousin, 2009; Bryman, 2012) have cautioned us about this ‘warfare’ and warned that this lack of consensus in methodological approaches may have “serious implications for the nature and function of educational research” (Hammersley, 1993: xiii). Cousin (2009) proposes that there are research questions that require a quantitative approach that would include complex statistical analysis, other research questions that would require a qualitative approach while other research questions would at times require a mixture of the two approaches. Similarly, Denzin and Lincoln, (2011c:95) suggest that “This is an age of emancipation; we have been freed from the confines of a single regime of truth and from the habit of seeing the world in one colour.” Johnson and Onwuegbuzie (2004) claim that the most important thing is the research questions: research methods would then follow on what would be the most effective way to offer thorough answers.

We are nowadays encountering a “third methodological movement” (Teddlie & Tashakkori, 2003; Gorard & Taylor, 2004) which is calling for a mixture of different approaches called Mixed Methods (MM) approach. Tashakkori and Creswell (2007:4) define the Mixed Methods (MM) approach as “research in which the investigator collects and analyses data, integrates the findings, and draws inferences using qualitative and quantitative approaches, or methods in a single study or program of inquiry.” This approach combines qualitative and quantitative designs, mixing methods of data collection, analysis and interpretation at different stages of the research process. Over the last decade, several studies have contributed to the founding of the Mixed Methods approach as an independent methodology through influential works that include Greene, Caracelli & Graham, 1989; Tashakkori & Teddlie 1998; Teddlie & Tashakkori, 2003, 2009; Johnson & Onwuegbuzie, 2004; Greene, 2007; Creswell, 2011, 2014; Creswell & Plano Clark, 2011; and Bryman, 2012. Creswell and Plano Clark (2011:2-6) revisit the definitions of Mixed Methods research that have emerged over the years by various authors and propose that a definition for Mixed Methods should include “many diverse viewpoints” (Creswell & Plano Clark, 2011:5) and, as a result, they define the core characteristics of Mixed Methods research as follows:

- collects and analyzes persuasively and rigorously both qualitative and quantitative data (based on research questions);
- mixes (or integrates or links) the two forms of data concurrently by combining them (or merging them), sequentially by having one build on the other, or embedding one within the other;
- gives priority to one or to both forms of data (in terms of what the research emphasizes);
- uses these procedures in a single study or in multiple phases of a program of study;
- frames these procedures within philosophical worldviews and theoretical lenses; and
- combines the procedures into specific research designs that direct the plan for conducting the study.

(Creswell & Plano Clark, 2011:5)

Mixed Methods offers a better understanding of the research problem than a single paradigm, building on the strengths of independent approaches and balancing their relative weaknesses (Tashakkori & Teddlie, 1998; Teddlie & Tashakkori, 2009; Creswell & Plano Clark, 2011; Bryman, 2012; Creswell, 2014).

3.3 Philosophical Assumptions applied to research methods

Quantitative, Qualitative and Mixed Methods approaches function within a framework of philosophical assumptions which are a set of beliefs that guide inquiry (Lincoln et al., 2011). Creswell and Plano Clark (2011) like Lincoln et al. (2011) make use of the term 'worldview' to refer to this set of beliefs while they also point out that the term 'paradigm' is often used synonymously with '*worldview*'. Baumfield et al. (2013:15) state that "beliefs and understandings about the world will dictate, consciously or unconsciously, the decisions you make at all stages of the practitioner enquiry process." Therefore, identifying one's philosophical assumptions is important since often researchers tend to overlook this stance (Creswell, 2014). Table 3.2 summarizes the six paradigms considered in this research.

While Quantitative approaches have been associated with positivist/postpositivist worldviews and Qualitative approaches have been associated with constructivist (or interpretivist) worldviews, the philosophical orientation most often associated with Mixed Methods is pragmatism (see Table 3.2). Pragmatism is often regarded as 'an alternative paradigm' (Greene, 2007) and a response to the paradigm debate (Howe, 1988; Tashakkori & Teddlie, 1998; Johnson & Onwuegbuzie, 2004; Teddlie & Tashakkori, 2009; Bryman, 2012). Pragmatism tends to be more practical rather than idealistic and it is 'practice-driven' (Denscombe, 2008; Cohen, Manion & Morrison, 2011). However, although pragmatism serves as the philosophical foundation of the third paradigm, Mixed Methods does not inhibit multiple views of the world. Creswell and Plano Clark, (2011:45) embrace the stance "that more than one worldview might be used in a mixed methods study.....multiple paradigms can be used in a mixed methods study and that they best relate to a type of mixed methods design."

	Positivism	Postpositivism	Critical Theory	Constructivism (Interpretivism)	Advocacy/ Participatory	Pragmatism
Ontology *(Nature of reality)*	Realism. There is a 'real' objective reality that is knowable	Critical Realism. There is a 'real' objective reality, but humans cannot know it for sure	Historical Realism. Reality can be understood, but only as constructed historically and connected to power	Relativist. All truth is 'constructed' by humans and situated within a historical moment and social context. Multiple meanings exist of perhaps the same data	Multiple realities.	Multiple realities. Pragmatists may be less interested in what 'truth' is and more interested in 'what works'
Epistemology (Nature of Knowledge)	Objectivist. The researcher can, and should, avoid any bias or influence on the outcome. Results, if done well, are true	Modified Objectivist. The goal is objectivity, but pure objectivity is impossible. Results are 'probably' true	Subjective. Knowledge is mediated reflectively through the perspective of the researcher	Subjective. Researcher and participants construct knowledge together	Objectivity with interaction with participants valued by researcher. Insider knowledge is highly valued	Objective/Subjective Accepts many different viewpoints and works to reconcile those perspectives through pluralistic means
Axiology (Role of Values)	Value-free inquiry	Values in inquiry. Unbiased. Checks used to eliminate bias	Findings are value mediated. Role of researcher is valuable	Inquiry is value bound. Researcher talks about their biases and interpretations	Biased and negotiated. Researchers negotiate with participants about participants' interpretations.	Values are important in interpreting results. Researchers include biased & unbiased perspectives
Methods & Methodology (Research strategies, techniques & procedures)	Quantitative Deductive	Primarily Quantitative. Triangulation. Deductive	Focuses on researcher/particip ant dialogue. Tends towards change using any appropriate method	Qualitative. Research through dialogue Inductive	Any Qualitative or quantitative with a critical stance. Participatory	Qualitative and Quantitative. Using best methods. Combining from Qualitative & Quantitative
Rhetoric *(use of language)*	Formal Style	Formal Style	dialectical leading to informed consciousness	Informal literary style	Advocacy and change	Formal or informal

Table 3.2: Six Research Paradigms considered for this research and adapted from Lincoln et al., 2011 and Creswell, 2014.

3.4 Typologies of Mixed Methods research design.

There are several approaches to MM design that have been proposed by various authors in the field. Creswell & Plano Clark (2011:56-59) exhibit a summarized classification of MM approaches discussed in the last decade.

For example, Greene, Caracelli & Graham (1989) identified the following designs:

a) ***Complementary*** – use of qualitative and quantitative methodologies to examine overlapping and different aspects of an inquiry in order to obtain better understanding.

b) ***Development*** **–** involves the use of one methodology after the other so that the first methodology leads the second in terms of decisions related to sampling, measurement and application.

c) ***Expansion*** – quantitative and qualitative methodologies are included in a study to enhance its purpose and breadth.

d) ***Initiation*** **–** similarities and differences in qualitative and quantitative findings are compared and analysed for new perspectives that can lead to new question/s.

e) ***Triangulation*** – involves the use of qualitative and quantitative to reach convergence of findings.

Triangulation of quantitative and qualitative methodologies is defined by Patton (2002:556) as "comparing and integrating data collected through some kind of qualitative methods with data collected through some kind of quantitative methods." Triangulation is considered as a precursor to what nowadays is known as Mixed Methods (Creswell, 2011).

Tashakkori and Teddlie (1998) identify the following designs (see Figure 3.1):

a) ***Equivalent status*** – both qualitative and quantitative approaches get the same importance or equivalent status. This may be carried out either sequentially, that is to say, the researcher first carries out a quantitative or qualitative (QUAN/QUAL) study and this will be followed by another quantitative or qualitative (QUAN/QUAL) study or it can be done in parallel or simultaneous strategy that is to say both quantitative and qualitative (QUAN + QUAL) are carried out concurrently.

b) ***Dominant – Less Dominant*** – either the quantitative or the qualitative gets more importance and this can be done either sequentially (QUAN/qual or QUAL/quan) or through a parallel or simultaneous strategy (QUAN + qual or QUAL + quan)

c) ***Multilevel use*** **–** this represents the use of different approaches (QUAN or QUAL) in different levels of the study. This design can also be used either sequentially or in parallel.

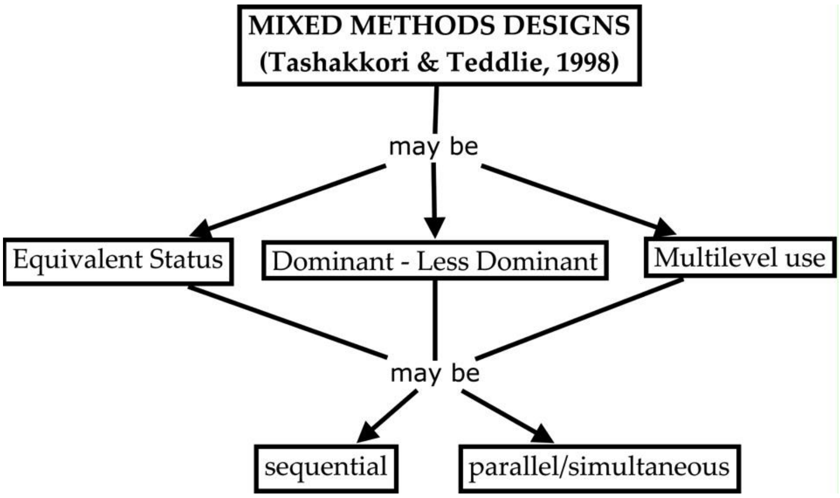

Figure 3.1: Mixed Methods Designs from Tashakkori and Teddlie, 1998.

Creswell and Plano Clark's (2011) design approaches differentiate between those designs which are 'typology based', that is to say a design which already exists in classification (listed here under a-f), and designs which are 'dynamic', that is to say they focus on process that takes into consideration and interrelates aspects of research designs instead of selecting a design from a pre-existing classification. The typology based Mixed Methods designs identified by Creswell and Plano Clark (2011) are the following:

a) ***Covergent parallel*** – quantitative and qualitative studies are conducted separately yet concurrently and merged at the point of interpretation for a more complete understanding of the inquiry.

b) ***Explanatory sequential*** – starts with a quantitative study through data collection and analysis and is followed by a qualitative data collection and analysis. This design is used when the researcher wishes to use qualitative findings to help interpret or contextualise quantitative results and therefore this is done sequentially.

c) ***Exploratory sequential*** – starts with a qualitative data collection and analysis which is then followed by a quantitative data collection and analysis. In this design the qualitative approach is considered exploratory, to be followed by further testing and verification during the quantitative phase, and therefore it is also sequential.

d) ***Embedded*** – the researcher conducts a traditional, either quantitative or qualitative, study but embeds a smaller study which may be either qualitative or quantitative to enhance the overall findings. The supplemental or embedded study may be conducted either concurrently or sequentially.

e) ***Transformative*** – uses a transformative theoretical perspective to advocate for social change, address social injustice or give voice to marginalised or underrepresented group.

f) ***Multiphase*** – combines quantitative and qualitative, either sequentially or concurrently, over a period of time to address an overall objective.

As we have seen from the different Mixed Methods design approaches discussed above, Mixed Methods provides the researcher with various advantages, but it also presents challenges in terms of time and cost: the researcher needs to be well versed in both qualitative and quantitative approaches, the underlying philosophical assumption of pragmatism may lead to the misinterpretation and misconception of 'anything goes' and the findings from the different approaches might not corroborate one another (Denscombe, 2010; Bryman, 2012). Therefore selecting a Mixed Methods approach may prove to be quite challenging and authors in the field (Tashakkori & Teddlie, 1998; Teddlie & Tashakkori, 2009; Creswell & Plano Clark, 2011; Bryman, 2012; Creswell, 2014) call for a clear rationale from the researcher for the reason why Mixed Methods will be employed.

3.5 Rationale for the research design.

With the above discussions in mind I will now attempt to present a rationale for the research design of this study in order to be explicit about the reason why this study will employ a Mixed Methods approach. This rationale will follow Creswell and Plano Clark's (2011:54) four key principles which, they suggest, a researcher has to follow when designing a study:

a) deciding on the type of design

b) identifying the design approach to use

c) matching the design to the study's problem, purpose and questions

d) being clear about the reason for adopting mixed methods

3.5.1 Deciding on the type of design

Deciding on the type of design refers to the decision the researcher has to make about using qualitative and quantitative methods before the research is started (fixed mixed methods design) or adding a second method after the study has begun (emergent mixed methods design) (Creswell & Plano Clark, 2011).

The first phase of this research followed a qualitative approach through action research. I chose action research since one of the objectives was to introduce the use of innovative metacognitive tools in Higher Education in Malta, which would subsequently serve as a stepping stone to bring about change in teaching and learning in this area. Therefore, Action Research (Lodico et al., 2010) suited this purpose as will be discussed in detail later in the chapter. After the data collection and analysis of the purposively selected student work products focusing on the learner, another research question relating to a different phenomenon, focusing on the teacher, emerged. After evaluating and reflecting upon the first phase of this study, I came to an understanding that what worked well for me, and what I saw much value and benefit in, might not work well for other lecturers. This was paradoxical, and so I decided to shed light upon this phenomenon by exploring what kind of teaching and learning was going on within Higher Education in Malta in order to pave the way for future educational research in this area and context, since at the moment this is lacking in Malta.

As a result, the type of design that this study will employ will be that of an ***emergent mixed methods design***.

3.5.2 Identifying the design approach to use

In section 3.4, I discussed how various researchers make use of different approaches for designing their Mixed Methods studies and the various Mixed Methods designs presented by various authors in the field. This study will adopt a ***typology-based approach*** (Creswell & Plano Clark, 2011) focusing on the ***multilevel mixed design*** as proposed in Teddlie and Tashakkori, 2009. Multilevel mixed designs are studies "in which data from more than one level of organisation or groups are used to reach more comprehensive inferences regarding behaviours and/or events. In educational research, for example, data that are collected at student level are linked to teacher attributes and school characteristics." Considering the fact that this study first focused on the learner through Action Research and then followed another data collection through interviews focusing on the teacher as well as the particular context that this was carried in, that is to say, Higher Education at the University of Malta, I concluded that a multilevel mixed design would be the most appropriate design to help me come to a better understanding of the overall study.

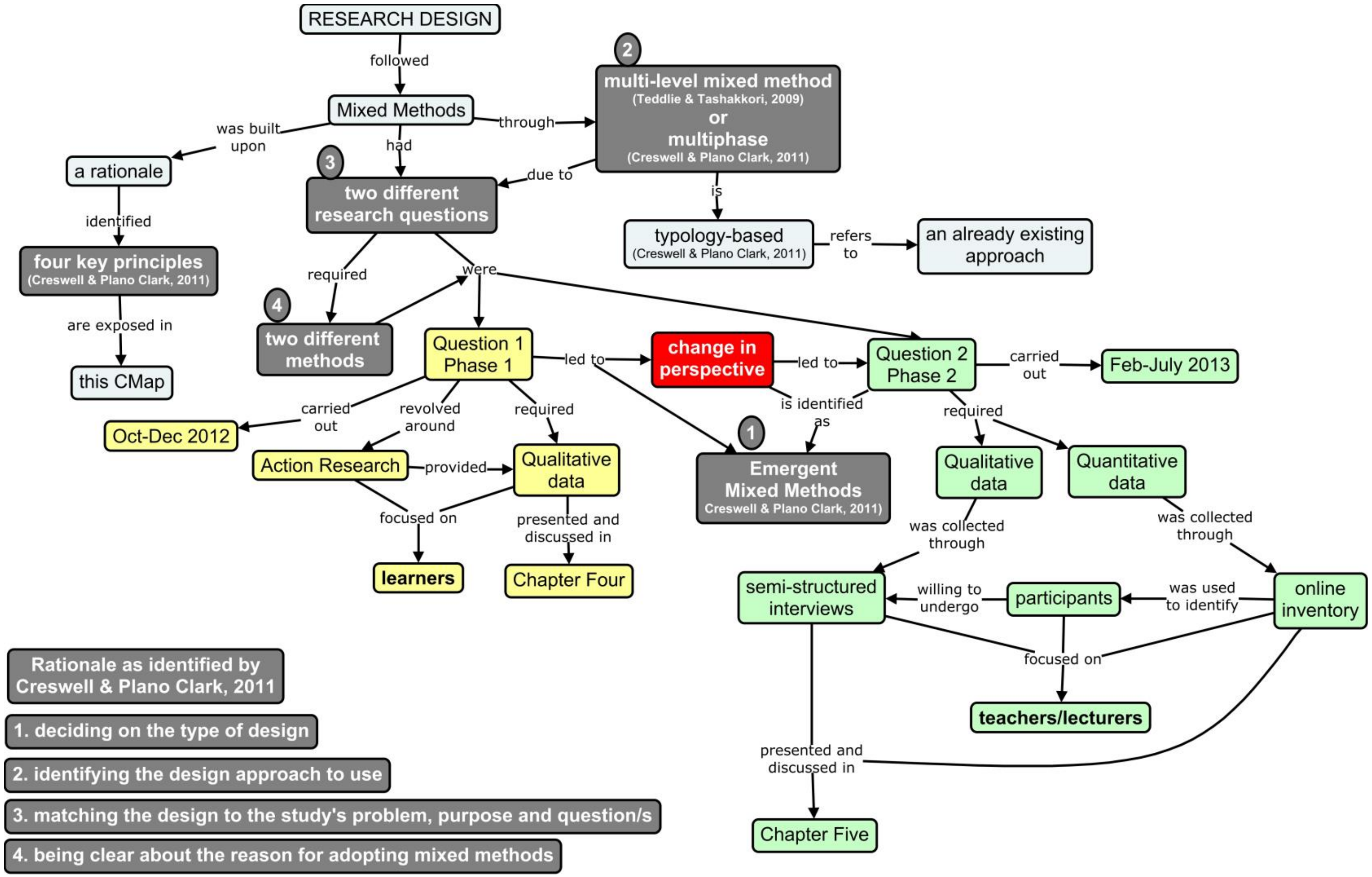

Figure 3.2: Visual Representation of the Research Design

3.5.3 Matching the design to the study's problem, purpose and questions.

> The importance of the research problem and questions is a key principle of mixed methods research design. This perspective stems from the pragmatic foundations for conducting mixed methods research where the notion of 'what works' applies well to selecting the methods that work best to address a study's problem and questions.
>
> (Creswell & Plano Clark, 2011:60)

This study's problem and objectives have been explicitly stated in Chapter One and the research questions are stated in this chapter. The first phase of this study revolved around meaningful learning and how this may be facilitated for the learner through the use of innovative metacognitive tools. Consequently, this phase called for a qualitative approach through Action Research and data was collected and analysed from students' work products.

The findings of the first phase led me to an understanding that the use of metacognitive tools enhances meaningful learning and that it is beneficial to focus on the learners. However, this cannot be done at the expense of minimising the importance of the role of the teacher (Jarvis, 2002, 2006a, 2006b; Ramsden, 2003; Richardson, 2005; Linblom-Ylänne et al., 2006). As a result, this phase led to another research question which focused on the lecturers, and data was collected and analysed from interviews with selected lecturers. An online inventory was used to help me overcome personal bias when selecting interviewees. The online inventory was administered with the main purpose of selecting prospective interviewees; however, it was also used to shed light upon what kind of teaching and learning goes on within the Faculty of Education. The responses given to the online inventory then served as precursors for the construction of the semi-structured interview schedule.

The research question constructed before the first phase and the research question that emerged after the data collection and analysis of the first phase required different methods of research, and this is why the Mixed Methods design seemed to be the most appropriate.

3.5.4 Being clear about the reason for adopting Mixed Methods.

One common feature in the literature about Mixed Methods (Teddlie & Tashakkori, 2009; Lodico et al., 2010; Creswell & Plano Clark, 2011; Bryman, 2012; Creswell, 2014) is to explicitly identify the reason(s) for mixing quantitative and qualitative methodologies within the study. The main reason why this study has adopted a mixed method approach was because the research questions constructed for the first and second phase of the research were different and, therefore, they required different approaches. Bryman (2012:640) lists this reason as one of the valid reasons for a researcher to adopt a Mixed Methods approach. As previously explained, this study followed an emergent mixed method design (Creswell & Plano Clark, 2011) and the collected data and analysis led me to explore another perspective in order to shed more light on the overall study. Griffin and Museus (2011:22) suggest that one of the purposes of mixing methods is to "seek paradoxes or new perspectives."

With all of the above in mind, the methodological position adopted in this study is based on Mixed Methods philosophical assumptions. This choice has been largely influenced by the objectives and the research questions constructed for the first and second phase of this research. This study embraces the pragmatist worldview (see Table 3.2 p.84) where, ontologically, truth is 'what works', epistemologically, pragmatism is not committed to any specific paradigm, knowledge claims "arise out of action, situations and consequences" (Creswell, 2014:10) and methodologically, pragmatists choose the methods, techniques and procedures of research that best suit their purposes and needs. This practice oriented methodological stance, that advocates the use of whatever philosophical or methodological approaches work best for a particular research problem, provides the rationale for mixed methods studies that adopt both a quantitative and qualitative approaches. Moreover, Lodico et al. (2010:16) propose that "in current research, pragmatic frameworks are used by both professional researchers and researchers who are primarily practitioners (for example, teachers...)". Consequently, even the Action Research carried out during the first phase of this research followed this perspective (Greenwood & Levin, 2007; Lodico et al, 2010) as will be explained in the sections that follow.

However, my professional background and the tools which I shall be using are founded on constructivist ideas. While not dismissing the fact that in Mixed Methods research, more than one world view can exist (Creswell & Plano Clark, 2011), this study will view constructivism from a pragmatic perspective leading to what nowadays is known as pragmatic constructivism (Colliver, 1999, 2000; Haas & Haas, 2002; Meyer & Land, 2006; Gordon, 2009), a perspective well noted in the literature.

In literature pertaining to constructivism one finds various criticisms. For example, Matthews (2000:492) states that "constructivism means different things to different researchers" and draws our attention to the lack of consensus among authors when defining constructivism. Similarly Tobias and Duffy (2009:4) suggest that there are numerous instructional models which are based on constructivist perspectives although "there are seldom efforts to look across models to define common principles or to refine the model and its theoretical underpinnings in ways that can be tested" and that "the lack of an emerging instructional theory parallels the lack of refinement of constructivist theory." Colliver (2000) states that although constructivism provides profound insights into the nature of human knowledge yet, in itself, it is not a theory of learning and he, therefore, suggests that "the idea of knowledge as a construction becomes more palatable and I think overwhelmingly convincing when it is coupled with a pragmatic view of justification" (Colliver, 1999:187).

Gordon (2009:41) presents an argument "that constructivist discourses have not had a bigger impact on educational practice" and that constructivism needs to be taken from the perspective of the practical concerns of educators, that is to say, practical recommendations which may be put into practice by teachers. Criticisms of the practical implications of constructivism are also discussed in detail in Westwood (2004) and Hirsch (2000). Gordon (2009:40) suggests that "what researchers need, then, is a clearer and more coherent notion of constructivism that is not merely a set of abstract ideas about knowledge and human existence, but is pragmatic and grounded in good teaching practices." Likewise, Meyer and Land (2006) state that "it's high time we got pragmatic about constructivism" and that viewing constructivism from a pragmatic perspective "invites us to treat constructivism as a toolbox for problems in learning." Haas and Haas (2002:574) describe pragmatic constructivism as a way "capable of generating useful mid-level truths without falling prey to the unresolvable philosophical, ontological and epistemological debates." Moreover, Gordon (2009:54) reveals that a pragmatic constructivist discourse is important "because it involves a shift in perspective away from the theoretical disciplines previously mentioned to the more practical field of education." This reading indicates that pragmatic constructivism is a way of linking theory to practice.

Consequently, the above discussions reveal the stance which this study embraces.

3.6 Reliability and Validity

Two of the most important criteria for the evaluation of any research are reliability and validity. Reliability is the degree to which a research method produces consistent results with similar samples (Merriam, 2009; Cohen, Manion & Morrison, 2011). Validity relates to the extent to which the research actually measures or describes the elements that are targeted to be measured or described. In simple words, validity refers to how well the research measures what is intended to measure (Merriam, 2009, Basit, 2010). Therefore, reliability on its own will not suffice; a research needs to be reliable as well as valid (Basit, 2010).

However, there are extensive arguments as to what makes up reliability and validity in qualitative research. Many researchers argue that features of reliability and validity seem to be geared mainly to quantitative rather than qualitative research. While some researchers within a positivist paradigm have adapted reliability and validity for qualitative research, others within a constructivist paradigm argue for an alternative set of criteria for evaluating qualitative research (Silverman, 2010; Creswell, 2011; Bryman, 2012; Denzin & Lincoln, 2013). For example, Merriam (2009:211) states that various authors on qualitative research argue that reliability and validity in qualitative studies should be congruent with the philosophical notions underlying the research. This would very often result in naming concepts of reliability and validity in a different way since different research studies would be seeking to respond to different criteria. Lincoln et al., (2011) propose two primary criteria for assessing qualitative research – trustworthiness and authenticity. On the other hand, Denzin and Lincoln (2013:27) state that in a constructivist paradigm “terms like credibility, transferability, dependability and confirmability replace the usual positivist criteria of internal and external validity, reliability and objectivity”. The debates of reliability and validity in quantitative research as opposed to qualitative research are lengthy and never ending and neither method is without flaws. Threats to validity and reliability cannot be completely eliminated in research projects and “we have to accept a measure of standard error in quantitative research and participants’ subjectivity in qualitative research” (Basit, 2010:64).

Notwithstanding the fact that criteria of reliability and validity in quantitative methods differ from those in qualitative methods, the literature notes a number of strategies which were common (Merriam, 2009; Basit, 2010; Bryman, 2012; Denzin & Lincoln, 2013; Creswell, 2014) and that would help to minimise the risks pertaining to reliability and validity in qualitative studies. These strategies are discussed below.

3.6.1 Pilot Study

One of the recommended strategies to determine the reliability and validity of a research is the carrying out of a pilot study. A pilot study project is like a preliminary study which is conducted prior to the actual research to allow the researchers to get a clearer idea of what they want to know and how they can best find it out and, as a result, how the main study will be conducted. The pilot study will be evaluated and reflected upon by the researcher and allows the researcher the opportunity to improve any flaws before the actual study takes place. Conducting a pilot study carries a number of advantages (Oppenheim, 1992; Merriam, 2009; Basit, 2010) and will minimise threats to validity and reliability.

One of the major steps in this Action Research study was to implement the solution proposed. Therefore, in order to enhance the validity and the reliability of the solution proposed, I carried out a pilot study. This pilot study served as a prelude to the main study and was carried out with a similar sample of participants in the same context and with the same approach, methodology and methods throughout. The pilot study enabled me to sharpen my thinking and reflection and the main study was adjusted accordingly.

3.6.2 Triangulation

Triangulation refers to the attempt to get a realistic picture of a situation by using different methods or methodologies of looking at it (methodological triangulation) or using different types of participants (sample triangulation) (Silverman, 2010). Triangulation is considered to be the principal strategy to ensure validity and reliability in qualitative research. To ensure reasonable validity and reliability for this research, I tried to avoid relying on a single source of data. I made use of the concept of triangulation, which involves using more than one source, during the first and second phase research in order to be able to obtain more reliable and valid research findings.

One of the steps in the Action Research carried out during the first phase of this study in order to attempt to answer the major research question was to evaluate the solution proposed. To enhance the validity and reliability of the evaluation of the solution implemented, I made use of three tools, namely, Vee Heuristics, Concept

Mapping and Let Me Learn to enable me to create a true picture of the learners selected for in depth case studies. These case studies were then used to evaluate whether the learning programme (i.e. the proposed solution) did yield meaningful learning. The analysis and evaluation was carried out through the use of Vee Heuristics and Concept Maps and backed by literature. Furthermore, the learners were asked to write a section on self-reflection as part of their assignment and this was used as another source to substantiate what was exposed in the Vee Heuristics and Concept Maps. This methodological triangulation minimised the risk of compromising reliability and validity and responded to trustworthiness and authenticity.

3.6.3 Bias

The secondary research question emerging from the first phase required different methods and different tools. In order to ensure the reliability and validity of the findings in the second phase research, I made use of an already validated inventory which was followed by semi-structured interviews to discover the degree to which the quantitative data collected through the inventory supported the qualitative interpretation generated through the semi-structured interviews.

One of the major causes of invalidity and unreliability in interviews is bias (Oppenheim, 1992; Merriam, 2009; Silverman, 2010, Creswell, 2013). One of the main reasons why the inventory was distributed before the semi-structured interviews was to overcome risk of personal bias. All interviewees were selected according to the responses given to the inventory following particular intentional criteria (see Appendix B). All interviewees were given the option to refuse to be interviewed (see Appendix D, Figure D.2 p.285). Furthermore, the several causes of bias in interviews as proposed by Oppenheim (1992:96-97) were taken into consideration (see Appendix I).

3.7 Ethics

Robson (2011:197) defines ethics as “rules of conduct; typically to conformity to a code or set of principles.” Sieber (1992:104) argues that “sound ethics and sound methodology go hand in hand.” Therefore, at the early stages of my preparations to carry out this whole research, I felt that it was vital to give serious thought to the ethical aspects of this study.

A distinction is sometimes made between ethics and morals. While both are concerned with what is good or bad, right or wrong, ethics are usually taken as referring to general principles of what one ought to do. Moreover, ethical issues do not necessarily arise at any particular stage of the study, but rather, they affect the whole research process (Robson, 2011). Sieber (1992:3) states that the ethical researcher must create "a mutually respectful, win-win relationship with the research population; this is a relationship in which subjects are pleased to participate candidly, and the community at large regards the conclusions as constructive."
Heggen and Guillemin (2012:467) reveal that "respect, beneficence, and justice provide foundation for human research ethics guidelines and frameworks internationally." Sieber (1992:18) explains these principles as follows:

a. Respect: The principle of respect for persons recognises autonomy and the protection of those who are not autonomous.

b. Beneficence: The principle of beneficence maximises possible benefits and avoids or minimises any possible harm to individuals and society at large.

c. Justice: The principle of justice carefully considers reasonable and non-exploitative procedures and their fair distribution. The selection of research subjects, in particular, needs to be scrutinised in order to determine whether the subjects have been chosen for reasons which are directly related to the problem under study.

With all of the above in mind, I followed the specific ethical guidelines of informed consent, confidentiality, consequences and researcher integrity as outlined in Kvale (2007). "Informed consent entails informing the research subjects about the overall purpose of the investigation and the main features of the design, as well as of possible risks and benefits from participation in the research project" (Kvale, 2007:27). This is secured through debriefing where the participants are provided with the necessary information before and after the research, to complete their understanding of the nature of the study. Confidentiality implies that the subjects' data will be kept anonymous at all times. This must be discussed with the research subjects beforehand. Consequences of a study "need to be addressed with respect to possible harm to the subjects, as well as expected benefits of participating in the study" (Kvale, 2007:28). The researcher must take into consideration the possible outcomes not only for the individuals taking part but also for the society at large that they represent. The integrity of the researcher, which includes "his or her knowledge, experience, honesty and fairness" (Kvale, 2007:29) is key to sound research.

Nowadays, most universities world-wide operate an ethics committee which usually draws up a set of guidelines that regulate researches. Members of a particular University, whether staff or students, need to seek consent from the Universities' Ethics Committee before actually embarking on a research study. I gained ethical approval from my University's ethics committee. Furthermore, there are other organizations such as the British Educational Research Association (BERA), the British Sociological Association (BSA) and the Economic and Social Research Council (ESRC), who have set up their own ethical guidelines to guide researchers so as to conduct research in accordance with recognised best practices and ethical standards throughout the research lifecycle of a project (Basit, 2010).

ESRC (2015) encourages researchers "to think ethically and emphasise the importance of identifying potential ethical issues throughout the research…researchers should ensure the maximum benefit of their research whilst minimising actual or potential risk of harm to participants or others affected by the research." Similarly, BERA (2011:4) states that all educational research should be conducted within an ethic of respect for:

- The Person
- Knowledge
- Democratic Values
- The Quality of Educational Research
- Academic Freedom

All of the above were carefully considered in a specific plan so as to establish and maintain positive human relationships with the individuals who participated in this research with the aim of achieving teaching and learning benefits both on a student level and for society at large. In addition to all of these obligations, I believe that acting ethically would only produce benefits for the research.

3.8 First phase research

This section will focus on the first stage of this study and will justify and explain in detail the sampling framework, the procedure and the processes used in this qualitative phase of the inquiry.

3.8.1 Context, participants and sampling.

In this study, the data were collected from University students pursuing the course in Bachelor of Education (B.Ed) at the University of Malta. The setting has not been chosen for a particular reason, but because it is the only Higher Education Institution in Malta which caters for teacher training. I am not a full-time member of staff at the University of Malta; however, I was given the opportunity to deliver a fourteen hour programme, which in our setting we refer to as two ECTS (European Credit Transfer System), with the support of the Faculty of Education, Department of Mathematics, Science & Technical Education and the Centre for Environmental Education and Research (CEER) within the University of Malta. 'Credit' is the word we use in our context and it refers to 'module' or 'study unit'.

The lectures were given at the University of Malta and were held once a week for seven consecutive weeks during the first semester (October 2012 – January, 2013), and each lecture had a duration of two hours. The credit was entitled 'The Learning Process and Education for Sustainable Development'. This programme was offered to B.Ed students who are in their second, third or fourth (last) year of the course as an *optional* credit. The term 'optional' means that the students are not obliged to do it but, on the other hand, all students have to select two optional credits each year, apart from their core course credits. Consequently, this credit was among the list of optional credits, and the students were free to choose any two credits. As a result, the group of participants in this study was self-selected since they came to this credit freely by their own choice. It is also worth mentioning that in this way, the students participating in this study have different subject specialisations.

The data collected was then analyzed and in Chapter Four illustrations of the work products generated by the students is presented. The work products include the Vee Heuristics created by the students. The Vee Heuristics exhibit the Concept Maps constructed by the students **before** and **after** the learning programme. This data collection helped me to evaluate and analyse the learning programme.

As the students attending this credit were self-selected since they chose to attend for diverse reasons, this is a non-probability sampling. All the students participated in the above mentioned process; however, Chapter Four illustrates in detail seven different work products of seven different learners. These were chosen on purpose (purposive sampling) to depict different learning patterns and how these revealed different cognitive structures and underlying mental processes. These seven case studies were used to evaluate the implemented solution i.e. the learning programme, in order to decide whether this programme facilitated meaningful learning or otherwise. In this way the data and analysis became richer and helped in answering the research question.

Non-probability and purposive samples are often used in qualitative research (Merriam, 2009; Cohen, Manion & Morrison, 2011; Bryman, 2012). Non-probability sampling is used whenever the researcher intends to use the data neither to make generalisations nor to answer questions such as “how much?” or “how often?” but to discover or gain insight into a particular issue (Merriam, 2009; Cohen, Manion & Morrison, 2011; Bryman, 2012). Non-probability sampling, therefore, seemed to be the most suitable sampling strategy for the qualitative part of this study since the aim was not to generalize, but to shed light upon a process of teaching and learning.

The most common form of non-probability sampling is purposive (Cohen, Manion & Morrison, 2011; Bryman, 2012) or purposeful (Patton, 2002). Patton, (2002:46) suggests that

> the logic and power of purposeful sampling derive from the emphasis on in-depth understanding. This leads to selecting **information-rich cases** for study in depth. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the research, thus the term **purposeful** sampling (original emphasis).

Denscombe (2010), Cohen, Manion and Morrison (2011) and Bryman (2012) further clarify that this kind of sampling is conducted with reference to the objectives of the research and selection is made in terms of criteria that will allow the research questions to be answered effectively.

3.8.2 Action Research

The tradition which best suits this qualitative research is Action Research. Qualitative researchers “often espouse a commitment to demonstrating the viability of truly alternative educational approaches” (Shulman, 1997:18) and “If we can create and sustain a particular instructional innovation in a real school, we have demonstrated the possibility that it can exist” (Shulman, 1997:19). Corey (1953:6) argues that action research “is a process in which practitioners study problems scientifically so that they can evaluate, improve and steer decision-making and practice.” Similarly, Robson (2011:188) states that action research is distinguished in terms of its purpose “which is to influence or change some aspect of whatever is the focus of the researcher.” As a result, action research revolves around improvement and involvement (Corey, 1953; Stenhouse, 1975; McNiff & Whitehead, 2002; Robson, 2011) and therefore “the distinction between research and action becomes quite blurred” (Patton, 2002:221).

The advancement of Action Research is credited to Kurt Lewin, a social scientist, who in 1946 used it as a methodology for intervening in the post war issues of the day and “was deliberately intended to change the life chances of disadvantaged groups” (Cohen, Manion & Morrison, 2011:344). Lewin was the first to propose action research as a cyclical process consisting of planning, fact-finding, action taking, evaluating and reflecting followed by more planning, fact-finding and revising (Lewin, 1946, 1948; Cohen, Manion & Morrison, 2011; Pelton, 2010). In 1953, Stephen Corey, a researcher from Columbia University’s Teachers’ College, published Action Research to Improve School Practice. This was the first systematic attempt to define Action Research in education as a process that enabled teachers to study their own practices with the aim of amending and improving. However, this soon lost momentum due to the sceptical and dominant positivist researchers at that time (Pelton, 2010). Action Research emerged again in the 1970s in Britain, primarily through the influence of the works by Lawrence Stenhouse who also promoted the idea of “teachers as researchers” (Stenhouse, 1975; Pelton, 2010). Stenhouse (1975:144) called for “the commitment to systematic questioning of one’s own teaching as a basis for development; the commitment and the skills to study one’s own teaching; the concern emphasised was to question and test theory in practice by using those skills.”

McNiff and Whitehead (2002:71) claim that the basic steps of an action research process constitute the following action plan:

- review your current practice
- identify an area of practice to be investigated
- imagine a solution
- implement the solution
- evaluate the solution
- change practice in light of the evaluation
- evaluate the modified action
- continue until you are satisfied with that aspect of your work.

Cohen, Manion and Morrison (2011:355) present the process of action research in the following framework (see Figure 3.3):

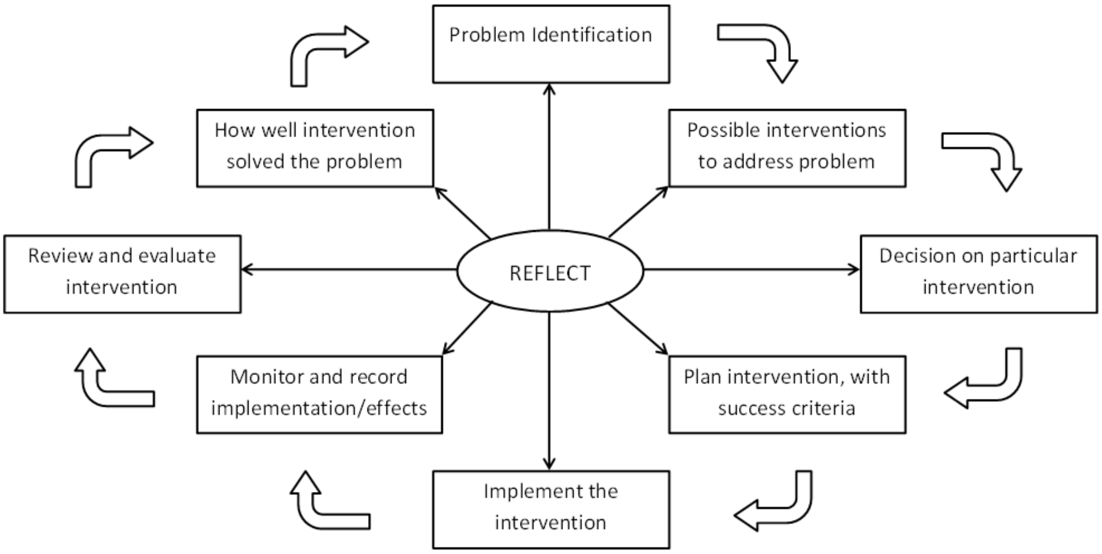

Figure 3.3: Action Research Framework as presented in Cohen, Manion & Morrison, (2011: 355)

Action research is, nowadays, a useful tool that allows educators to systematically and empirically address topics and issues that affect teaching and learning in the classroom. It is widely used as a systematic process to solve educational problems, change and make improvements. McNiff regards action research "as an approach to education that encourages teachers to be aware of their own practice, to be critical of it and to be prepared to change it" (McNiff, 1992:4).

Within this premise, action research can also be called a form of self-reflective practice (Carr & Kemmis, 2004; Cohen, Manion & Morrison, 2011). It is also concerned with 'praxis' (Kincheloe, 2012) – the process of reflection and action, with the aim to emancipate; which "is strongly empowering and emancipatory in that it gives practitioners a 'voice'" (Cohen, Manion & Morrison 2011:34). Moreover, since action research is built upon collaboration between the professional researcher and the local stake holder, it integrates praxis with theory (Denzin & Lincoln, 2011a). Similarly, Somekh (1995:340) views Action Research as a bridge that fills the gap between research and theory where the two processes are integrated. Kember (2001) notes that Action Research has in the last decade become more popular in research to improve quality of education within Higher Education and "it is one of the few strategies for quality improvement or educational development underpinned by both a theoretical framework and by practical experience" (Kember, 2001:32).

The above discussion about action research has explained the rationale for taking an action research approach in the first phase of the study. The tools used and how they were used is a completely innovative strategy in Higher Education in Malta and I, as a practitioner researcher, felt the need "to initiate change" (Elliott, 1991:53). Lodico et al. (2010:289) propose that

> underlying all action research is the assumption that practitioners are capable of independent action and systematic inquiry into their own educational practices. Furthermore, action research is based on the assumption that as insider, practitioners have valuable knowledge that needs to form the basis for making decisions about schools.

Therefore, action research takes either the emancipatory-liberatory framework or the pragmatic framework as its philosophical basis. Action researchers who take an emancipatory-liberatory framework seek ways to assist groups who are considered as under privileged or marginalised within an educational system while action research based on a pragmatic framework involves "looking at issues or problems in one's own classroom, school, or educational setting to see how practice can be improved" (Lodico et al., 2010:289). Consequently, this study will go through an Action Research process based on a pragmatic framework and will follow Takala's (1994) steps in the process which include: identifying the question (research question), creating a solution, implementing the solution; evaluating and modify one's ideas and practice in light of the evaluation. The above literature was taken into consideration in the planning of this research and each of the steps identified in action research were followed and represented in the various chapters of this study (see Figure 3.4).

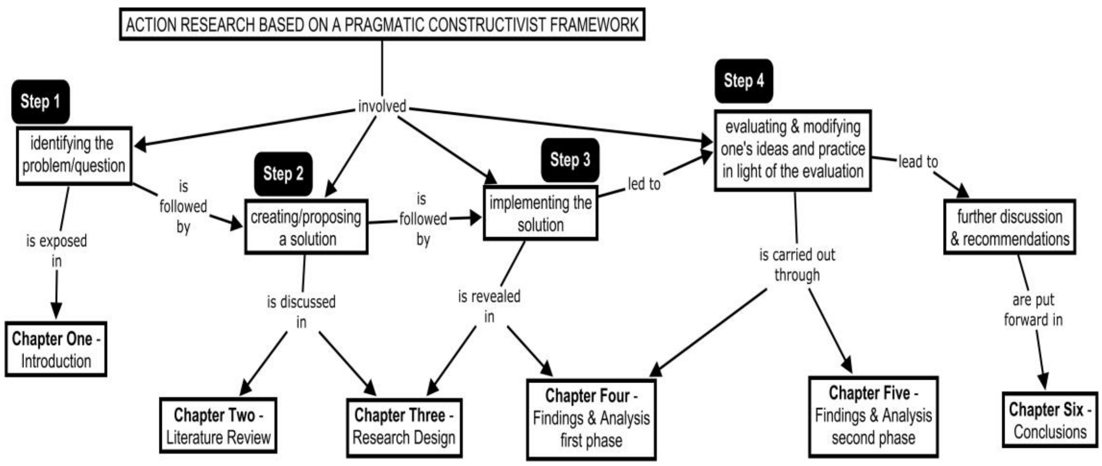

Figure 3.4: The Action Research steps as presented through this study.

3.8.3 Conducting action research

Being an Action Research, this study aims to make beneficial change and therefore it is concerned with activity and change. In order to do this, it is necessary to understand what is happening and to evaluate it.

An in-depth study of specific case studies is one of the outstanding approaches in action research. The production of case stories shows how researchers improved their own learning and situations for the benefit of themselves and others. They provide undeniable evidence that action research is a form of learning that has insightful implications for future societies, and that it could lead to transformation or change (McNiff & Whitehead, 2002; Mcniff, Lomax & Whitehead, 2003). Considering this, although the learning group was made up of fifteen students and the whole group participated in the learning programme, yet, seven different work products from seven different learners were selected on purpose (purposive sampling) as case studies "to essentially examine a case in depth" (Basit, 2010:12) rather than in breadth. This was one of the steps in the cyclical Action Research process with the aim to evaluate the learning programme which was implemented. How these learners were selected is explained in section 3.8.1 *Context, participants and sampling*.

As the first phase used a qualitative methodology, it does not aim to make generalizations, but, to expose and delve deep into a particular process of teaching and learning. The case studies presented will not be contributing to statistical generalizations but rather they will lend themselves to a naturalistic generalization (Basit, 2010). I opted for case studies since, as previously explained, this research is not aimed at generating absolute truths but aims to gain insight into a particular teaching and learning process which would enhance teacher/student interaction and facilitate meaningful learning. Furthermore, this was determined by the kind of research question posed for this study and which is presented at the beginning of this chapter (Shavelson & Towne, 2002; Bryman, 2012; Yin, 2012). Case studies provide "a unique portrayal of real people in a real social situation by means of vivid accounts of events, feelings and perceptions" (Basit, 2010:19). This helped to make richer the evaluation and analysis of the learning programme and to help in answering effectively the research question.

3.8.4 Tools used to gather data

3.8.4.1 Concept Maps

Concept maps emanated through a 12-year longitudinal research programme carried out by Joseph D. Novak and his graduate students at Cornell University. It started off as a new paradigm in cognitive learning which highlights the learner's mental processes as the major factor in learning, therefore opposing the behaviourists. Novak's research focused around Ausubel's learning theory (1968).

Concept maps offer a method of representing incoming information visually and are like visual road maps showing some of the pathways one may take to connect meaning of concepts. One of the values of Concept Maps is that, when children construct their own Concept Maps for a question or problem in any domain, they clearly convey at a glance, 'what the learner already knows' and as educators we can thus plan to build upon this (Kinchin et al., 2000; Kinchin, 2004; Cañas, 2003; Cañas et al., 2004, Vanhear, 2008).

Concept Mapping is a tool which facilitates the representation of knowledge and supports the graphical representation of statements (Novak, 1998; Cañas & Novak, 2006; Novak & Musonda, 1991). Furthermore, Concept Mapping offers some additional possibilities when compared to a pure text based analysis (Kinchin et al., 2010). Concept maps involve nodes usually enclosed in circles or boxes and links usually indicated by a connecting line between the two nodes. The concepts are represented in nodes and their relationships to other concepts are specified by the links between them. Therefore, node-link-node triples in concept maps form propositions. Propositions contain two or more concepts connected with other words to form a meaningful statement (Novak & Gowin, 1984; Novak, 1998; Cañas et al., 2004).

3.8.4.2 CMapTools™

For the past couple of years the Institute for Human & Machine Cognition (IHMC) in Florida, USA, has been developing CMapTools, a client-server based software kit that is designed to facilitate and support the construction of Concept Maps by users of all ages and to enable collaboration and sharing during that process. This software facilitates the construction of Concept Maps just as a word processor supports the task of writing a text (Cañas et al., 2001) (see Figure 3.5, Figure 3.6)

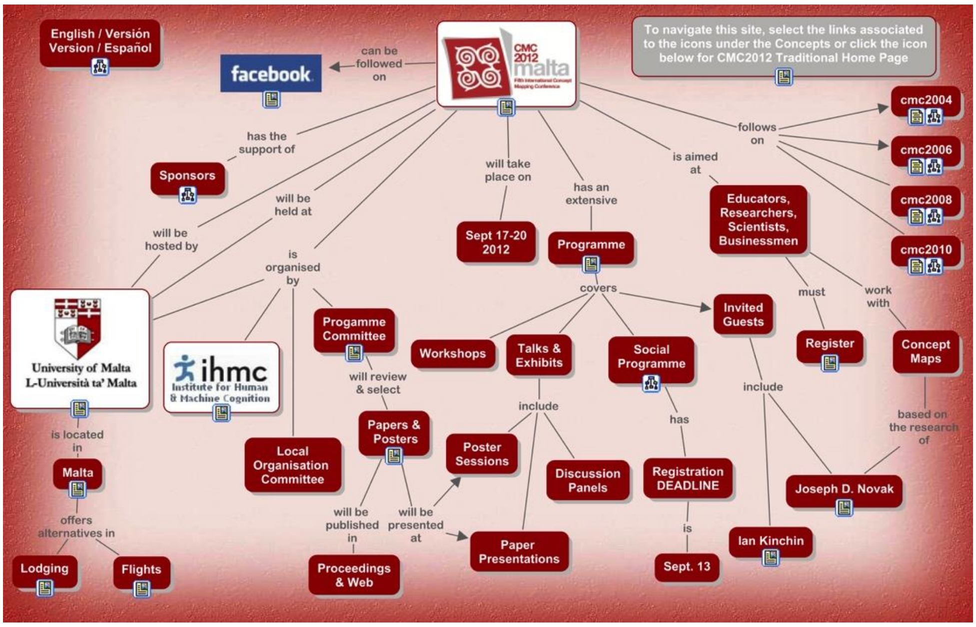

Figure 3.5: A Concept Map I created with CMapTools for CMC2012 The Fifth International Conference on Concept Mapping.

The Concept Map displayed in Figure 3.5 was constructed by me with the CMapTool software for the Fifth International Conference on Concept Mapping which was held in Malta between 17th – 20th September. If one looks closely at the cmap one will note that there are particular icons under specific nodes such as 'sponsors' or 'programme' etc. These icons are yet another aspect of the structure of Concept Maps when constructed with the CMapTool software, and they represent the advantage of adding resources with further information. For example, when clicking on the icon beneath the node 'CMC2012', a picture of the spiral design displayed in the logo and representing Malta's Neolithic temples is displayed. Attached to this icon, one will also find a word document with an explanation of the spiral symbol in Malta. In actual fact, one may add one or more resources to one particular icon. The information which can be included in the nodes varies from images or word documents to audio or movie clips to web links. If we take for example the node 'Malta' the icon takes you to links regarding information about Malta together with a Map of Malta. On the other hand, if one clicks on the icons beneath the node 'social programme', this icon will take you to another Concept Map displaying various activities and other relevant information regarding the social programme. Figure 3.6, displays some of the features explained in this paragraph.

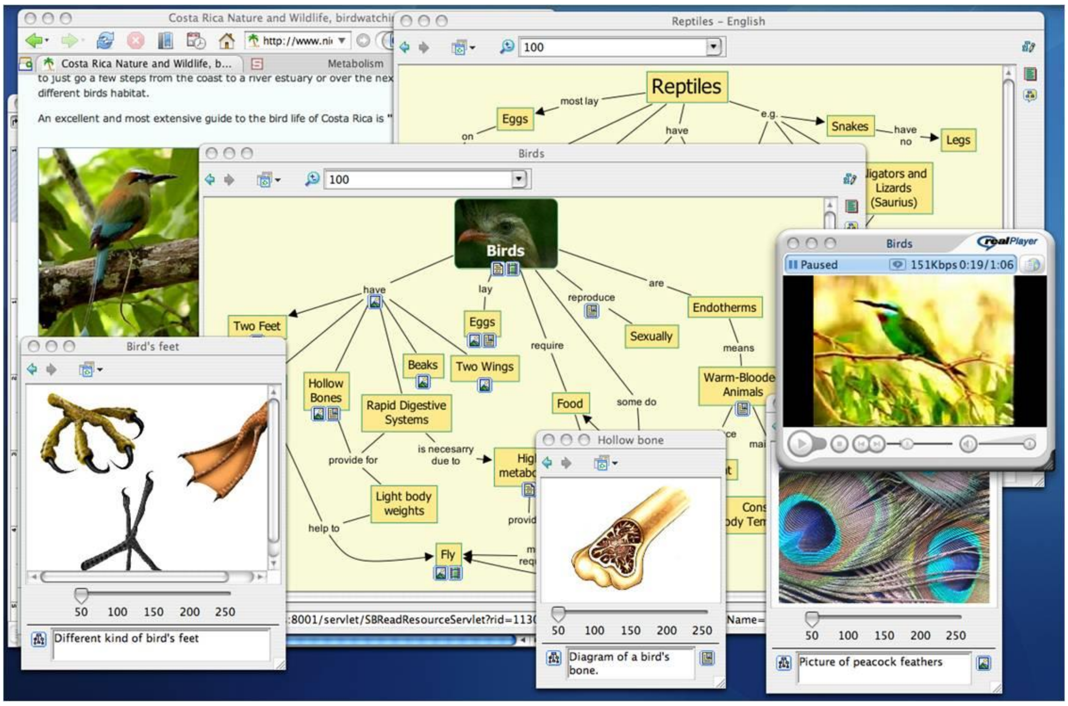

Figure 3.6: A Concept Map about birds constructed by a high-school student as presented in Cañas & Novak, 2006. Icons under the concepts provide links to resources (e.g. images, pictures, web pages, videos, other concept maps), some of which are displayed in this Figure.

This software is free to download and is available in many languages and is used extensively throughout the world. It has evoked a collaborative network where any user, whether a student, teacher, scientist, researcher or businessman can create their own space and reveal their knowledge models. This kind of new technological idea along with research on meaningful learning can improve and promote a new educational model, which can overwhelm the prevailing model of teachers as disseminators of information and students as inert recipients.

3.8.4.3 Vee Heuristics

The Vee Heuristics, also known as Gowin's **V** were invented at Cornell University in the US in 1977 after a decade of research in science, science education, philosophy of science and philosophy of education. However, although Vee Heuristics originated in the sciences, various researches prove their worth in other educational contexts (Novak, 1998; Chrobak, 2001; Åhlberg, 2002; Åhlberg & Ahoranta 2002; Cañas et al., 2004; Moreira 2004; Gowin & Alvarez, 2005;)

Novak & Gowin (1984) suggest that the "Vee Heuristic is a tool for acquiring knowledge about knowledge and how knowledge is constructed and used" (Novak & Gowin, 1984:57). Vee Heuristics were created to foster teacher and student interactions "resulting in creating meaning through negotiation of ideas" (Gowin & Alvarez, 2005:4).

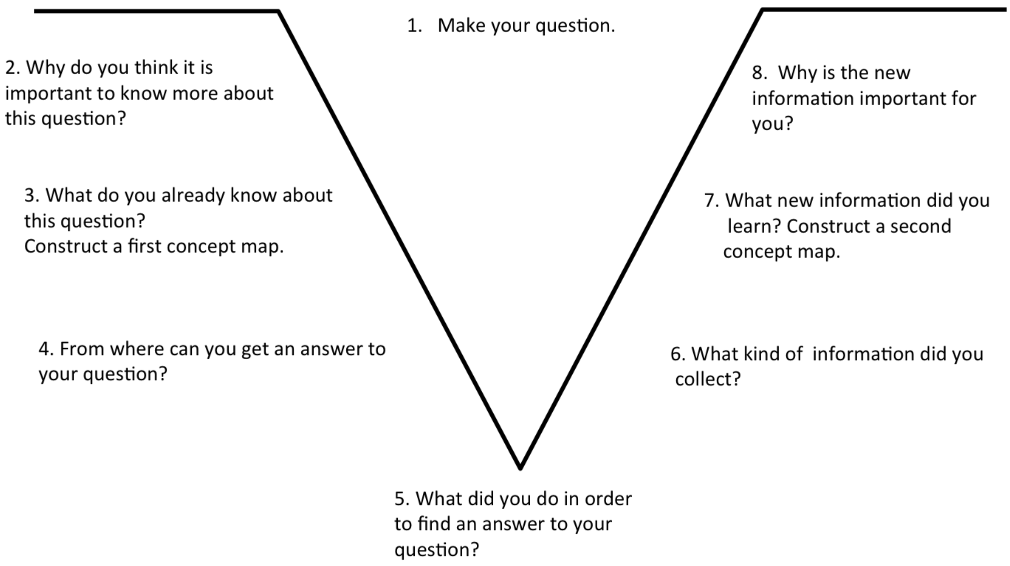

Figure 3.7: My modification of Åhlberg & Ahoranta's (2002) improved Vee Heuristics

As discussed in Chapter Two (p.55) Gowin's original Vee was too complex for the context in which, and the participants with whom, this study was carried out. Consequently, I opted to make use of Åhlberg and Ahoranta's (2002) improved Vee Heuristics since it represents a process of reflection and action as presented in Gowin's original Vee, but in a way which is more accessible and easier to be applied and understood by both teachers and students. Moreover, I felt the need to adjust the words mainly for the purpose of linguistic translation, and for the better understanding of my students and in consideration of our context (see Figure 3.7). A detailed comparison of Gowin's original Vee and Åhlberg and Ahoranta's (2002) improved Vee Heuristics is presented in Chapter Two (p.55).

3.8.4.4 The Let Me Learn® Advanced Learning System

The Let Me Learn process is an advanced learning system that assists individuals' understanding by enabling them to use their learning processes with intention and using metacognitive strategies in order to succeed in a learning task. The Let Me Learn System is founded on a constructivist perspective (Dawkins et al., 2010) (see Chapter Two, p.72-73) since it empowers learners to discover who they are as learners and then suggests strategies to enable them to be autonomously successful in different learning settings.

With an awareness and understanding of the diverse learners' learning patterns, teachers and students may form partnerships based upon the knowledge of each other's ways of processing incoming information. Subsequently, they would be able to create an environment in which they have the opportunity to formulate specific techniques and strategies for developing learning that makes sense to them (Johnston & Johnston, 1997; Vanhear 2008). Consequently, learners become the agents of their own learning since they are actively participating in their own learning process with a specific intention.

To sum up, therefore, the innovative Vee Heuristics and Concept Mapping were merged with my prior knowledge and experience of Let Me Learn advanced learning system for use in this research mainly because they have the following common features:

a) they are considered as metacognitive tools;

b) they are based upon constructive epistemology;

c) they build on prior knowledge and experiences;

d) they are grounded in theories of how people learn;

e) they take into consideration that learning is affected by thinking, doing and feeling;

f) they are tools which are used with intention to support the learner in developing personal structures of meaningful knowledge;

g) they have been empirically tested and used for a number of years yielding positive results on student learning achievement.

3.8.5 Procedure for how the tools were used during the first phase research.

This section explains the process of the Vee Heuristics, along with Concept Maps and Learning Connections Inventory (LCI) results, that were generated throughout the whole credit by each different learner. All the lectures were presented through Concept Maps where prior knowledge and new knowledge construction was negotiated through active discussion and participation. The students were also given a pack of set-reading and at the end of each lecture they were asked to read particular parts of this pack which was related to the topic which would be tackled during the next lecture. Needless to say, they were encouraged to do further reading.

During the first lecture the students were asked to reflect, answer and write about the three steps found on the left hand side of the Vee (see Figure 3.8). It is worth noting that Question 2 revolved around how the student was feeling as related to the topic to be studied. Question 3 focused on cognition and captured the students' prior knowledge about the topic under study. Question 4 focused on what action the student intended to take in order to learn.

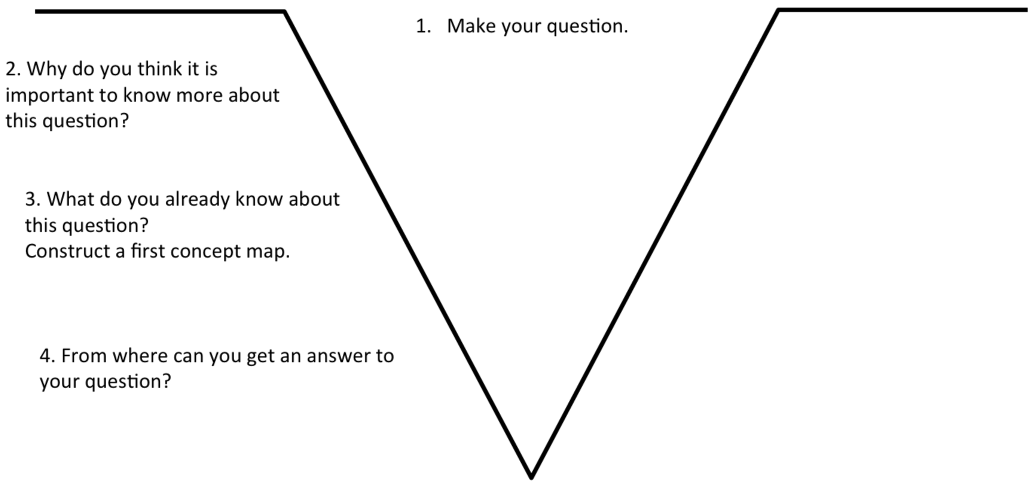

Figure 3.8: The left hand side of the Vee which was done during the first lecture.

Their responses were collected at the end of the first lecture, they were analysed and the learning programme was planned so as to accommodate the learners' different learning preferences which were revealed in their responses. These preferences were also substantiated with the result scores obtained through the Learning Connections Inventory (LCI) which was administered to all the students. As a result the teacher, in her planning, will in this way be taking into consideration not only cognition (prior knowledge) but also feelings about the topic to be studied and how the learners expect to learn, that is to say, what they intend to do in order to learn.

During the last lecture, after the whole learning programme, the students were asked to complete the right hand side of the Vee (see Figure 3.9). In this way, the students had a complete Vee Heuristic including a Concept Map depicting their prior knowledge *before* the learning programme and another Concept Map revealing their development of knowledge *after* the learning programme. Furthermore, the complete Vee Heuristic will also exhibit what the learners actually did to learn (Question 5) and how they felt at the end of the Vee (Question 8).

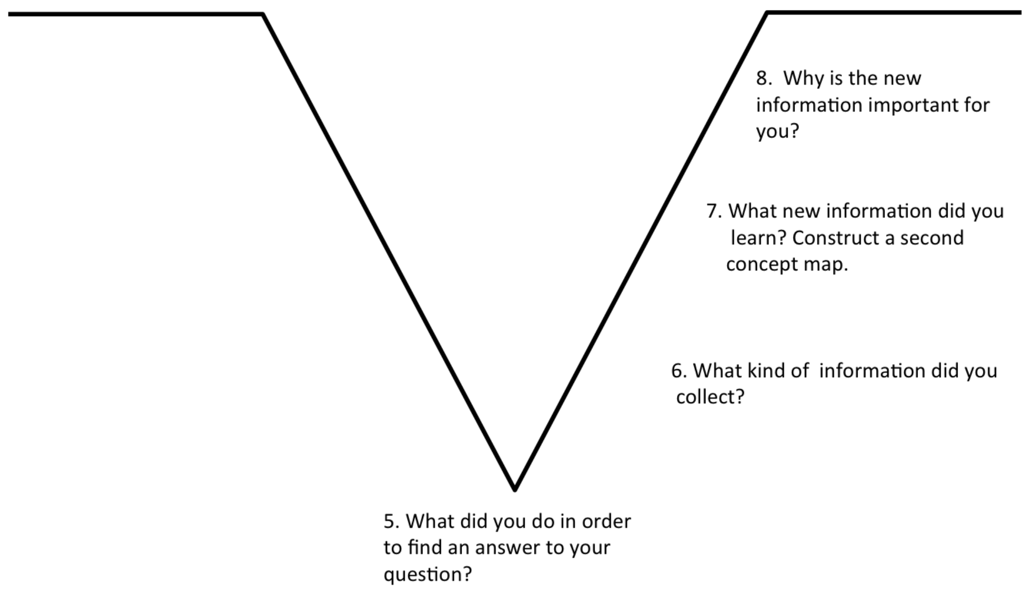

Figure 3.9: The right hand side of the Vee which was presented at the end of the learning programme.

Finally, they were asked to organize and compare and contrast all the steps in the Vee Heuristic by presenting, as an assignment, the complete Vee Heuristic, i.e. the left and the right hand side of the Vee, including the first Concept Map depicting their prior knowledge and the second Concept Map illustrating their new knowledge construction. They were also asked to insert in the assignment their Learning Connections Inventory (LCI) revealing their learning patterns and to write a final reflection about their own personal growth during the programme, if any, and how they thought that this process had helped them to become more effective and reflective teachers, if it did.

3.8.6 Data Analysis in the first phase

The analysis of the data presented in Chapter Four will revolve around Novak's meaningful learning theory (see Chapter Two p.61). The Concept Maps in this research were not used as an assessment tool and they have not been analysed for correctness. Like Kinchin (2001:1258) I do not see much value in scoring these maps and "reducing a concept map to a numerical score can be cumbersome and, in the end unrevealing." This research focuses on the process of learning rather than on the content of learning. The Concept Maps were analysed to capture cognitive structures and how the knowledge developed (Larkin, 2010). Therefore, so as to analyse these Concept Maps appropriately, I shall be using terminology from Kinchin et al. (2000) and Kinchin (2001) where a scheme of three categories (spoke, chain and net) was proposed to identify three main Concept Map structures (see Figure 3.10 and Table 3.3).

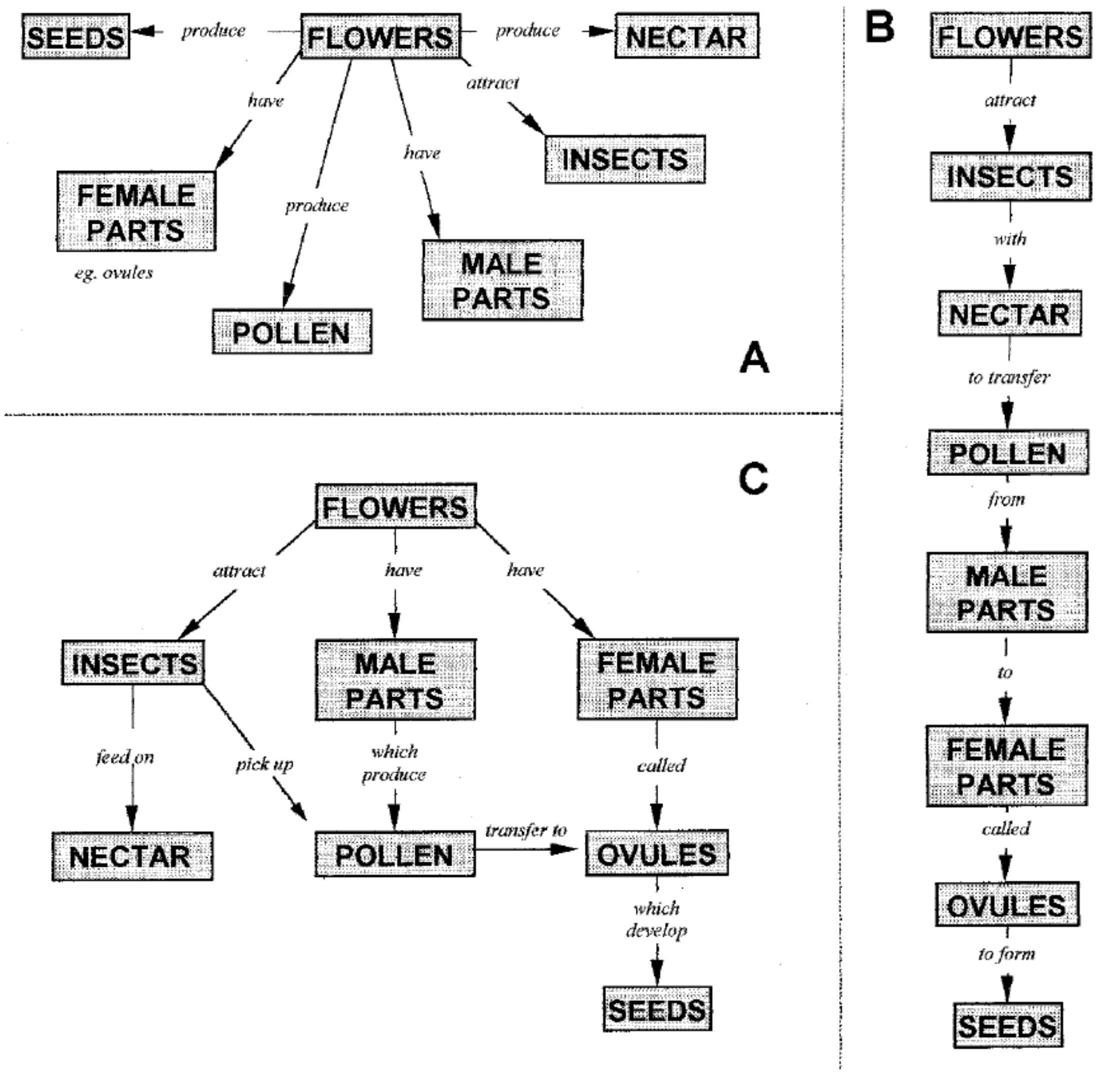

Figure 3.10: The three main Concept Map structures identified in Kinchin et al., 2000

A. **Spoke** – a radial structure in which all the related aspects of the topic are linked directly to the core concept, but are not directly linked to each other.

B. **Chain** – a linear sequence of understanding in which each concept is only linked to those immediately above and below. Though a logical sequence exists from beginning to end, the implied hierarchical nature of many of the links is not valid

C. **Net** – a highly integrated and hierarchical network demonstrating a deep understanding of the topic.

	Map type		
	Spoke	*Chain*	*Net*
Hierarchy	One level only	Many levels, but often incorrect – e.g. 'female parts' are shown as subordinate to 'male parts' in Figure 2(b)	Several justifiable levels
Processes	Simple association with no understanding of processes or interactions	Shown as a temporal sequence with no complex interactions or feedback	Described as complex interactions at different conceptual levels
Complexity	So little integration that concepts can be added without consequences for 'map integrity'	Map integrity cannot cope with additions, particularly near the beginning of the sequence	Map integrity is high. Adding one or more concepts has minor consequences as 'other routes' through the map are available
Conceptual development	Shows little or no 'world view'. Addition or loss of a link has little effect on the overview	Integrated into a narrow 'world view', suggesting an isolated conceptual understanding. Loss of a link can lose meaning of the whole chain	Can support reorganization to emphasize different components to appreciate a 'larger world view' or to compensate for a 'missing' link
Represents	National Curriculum structure	Lesson sequence	Meaningful learning

Table 3.3: Characteristics of spoke, chain and net style Concept Maps as in Kinchin, 2001

In order to present a rigorous and richer analysis of the Concept Maps constructed before and after the learning programme, I decided to include and follow the criteria which were developed in Hay (2007:43-44) to differentiate between deep learning, surface learning and non-learning. The following criteria were mainly formulated upon the definition of deep learning stemming from Novak's definition of meaningful learning (Hay, 2007).

Criteria identifying deep learning:

1. The second map must show both newly learnt concepts (that were not included in the first) and original (prior) conceptions.
2. The second map must show that the new knowledge has been linked to the prior knowledge in ways that are meaningful (i.e. that the linking statements

are valid and explanatory and provide evidence of meaning in the mind of the map author).

3. The overall knowledge structure of the second map is a significant improvement on the first (i.e. that it shows better organisation, higher linkage and richer exposition of meaning).

Failure to fulfil the above criteria would be evidence for surface learning (Hay, 2007). So the criteria for surface learning were:

1. The second map must show significant numbers of newly introduced concepts (ones that were not evident in the first), but these are not integrated with prior knowledge by linkage to concepts that are persistent from the first to the second map.
2. The second map will contain new concepts, but the conceptual linkage of the map as a whole will not be increased as a result.
3. The second map will not constitute a significant improvement on the first, either in terms of structural richness (linkage) or explanatory power (meaning).

If the first map and the second map show no change at all, i.e. they remain the same (i.e. a lack of conceptual change), this would evidence non-learning as typified in Jarvis (1993). Therefore, the criteria for non-learning were:

1. Persistence of prior knowledge from the first map to the second
2. The lack of evidence of significant reorganisation of conceptual structures from one map to the next.
3. The absence of newly introduced concepts in the second map.
4. The absence of newly developed links in the second map.
5. The absence of newly developed expositions of meaning among previously existing linking statements.

Finally, I shall also be taking into consideration various literature on Concept Mapping (Novak & Gowin, 1984; Afamasaga-Fuata'i, 2009; Cañas et al., 2004, 2006, 2008, 2010, 2012; Correia et al., 2014) that suggest that an increase in the number of concepts and propositions is an indicator of meaningful learning.

The Concept Maps were placed in a Vee Heuristic. The Vee Heuristic exposed the process which the learner went through to develop meaningful learning. Furthermore, from a comparison between the left hand side of the Vee which was compiled at the beginning of the programme and the right hand side of the Vee which was compiled at the end of the learning programme, I could analyse what kind of development had taken place. This kind of research strategy has been used with Vee Heuristics (Novak & Gowin, 1984; Åhlberg, 2002b; Åhlberg & Ahoranta, 2002, 2004; Gowin & Alvarez, 2005) and it reveals how the "change in the meaning of the experience combines the emotional and cognitive states and results in reorganizing our views by adding to our world knowledge" (Gowin & Alvarez, 2005:45). Therefore the analysis of the Vee Heurisitc revealed the combination of knowledge, feeling and learning in order to promote meaning.

Apart from the analysis of the Vee Heuristics and Concept Maps, I made use of the Learning Connections Inventory (LCI) to understand better how the learners preferred to learn and the process through which new knowledge was constructed. When a learner finishes compiling the LCI, the scores for each learning pattern (Precision, Sequence, Technical Reasoning, and Confluence) are represented in three different ranges: Avoid, Use As Needed and Use First (see Appendix A.6, Figure A.7 p.262). Each learner is described as a combination of learning patterns and this combination explains to what extent each learner uses each of the learning patterns (see Appendix A.6, Figure A.6 p.262 and Appendix L).

3.9 Second phase research

This section focuses on the second stage of the research. The qualitative data collected through action research during the first phase focused on the learner and is actualized in the students' work products in Chapter Four. However, whilst analyzing the data collected during the first phase of my research, I reflected on the possibility that what worked well for me as a lecturer to bring about meaningful learning might not work for other lecturers. Jarvis (2006b:32) also noted that "as every teacher knows, two teachers using the same techniques to teach the same content will frequently do so in entirely different ways and the outcomes of their lesson will not be the same." When I furthered my reading about approaches to teaching, this issue evolved into something quite complex. For example, Lindblom-Ylänne et al. (2006:294) report from their own research that "teachers who experience different contexts may adopt different approaches to teaching in those different contexts" and from this same research there was evidence "that approaches to teaching were related to teachers' discipline"; 'discipline' in this context refers to the subject that teachers teach. Apart from 'hard' and 'soft' disciplines (Biglan, 1973), there are other factors that affect approaches to teaching such as self-efficacy beliefs of university teachers and pedagogical training (Lindblom-Ylänne et al., 2006) and also teachers' character, personality and their perception of teaching (Jarvis, 2006b). This is where I reflected that one might acknowledge the beneficial aspects of using these pedagogical tools but, if a teacher/lecturer does not see value in this, he/she will find neither the time nor the effort to invest in these tools in their classrooms. If a lecturer is superficially engaged, no learning will take place no matter which tool is used. Therefore, the first phase revolved around the learner; however, one cannot minimise the importance of the role of the teacher in the whole process (Jarvis, 2002, 2006a, 2006b; Ramsden, 2003; Richardson, 2005; Lindblom-Ylänne et al., 2006) and I felt the need to gain greater understanding of this issue. Consequently, the first phase of qualitative research led to a second phase of research to explore some pertinent issues further. Exploratory studies are typically carried out to “satisfy the researcher’s curiosity and desire for better understanding” (Babbie, 2013: 90). McNabb (2010:42) defines exploratory studies as “small-sample designs used primarily for gaining insights and ideas about research problems and the variables and issues associated with these problems.” This second phase emanated also from the cyclical process of Action Research which calls for a review and evaluation of the implemented solution to see how well the intervention solved the problem (Takala, 1994; McNiff & Whitehead, 2002; Cohen, Manion & Morrison, 2011; Robson, 2011).

The research question constructed for the first phase of this study and the Action Research carried out focused on the learner. However, the secondary research question emerging from the analysis of the first phase highlighted the role of the teacher/lecturer. The research questions address different aspects and they require different research strategies, and this is the reason why this study opted for a Mixed Methods design (Bryman, 2012). The second research question emerged from the first phase and as a result this study used an emergent Mixed Methods design (Creswell & Plano Clark, 2011). Furthermore, since the second research question did not build on the first one, but explored a different perspective which emerged from the first phase, this study focused on a multilevel Mixed Methods design (Teddlie &Tashakkori, 2009).

3.9.1 Context, participants and sampling

To attempt to try and answer the second phase research question or, at least, to be in a better position to discuss, I carried out semi-structured interviews with a selected number of lecturers from the Faculty of Education within the University of Malta with the intention of shedding light upon what kind of teaching and learning goes on in Higher Education in Malta. The reason why I opted for semi-structured interviews and the criteria used are explained below.

The selection of the interviewees followed the criteria of purposeful sampling (Miles & Huberman, 1994; Patton, 2002; Merriam, 2009; Creswell, 2014;) as required by the nature of this study. However, Weathington et al. (2010:268) argue that “when the researcher begins to select participants for the study, the opportunities for bias increase dramatically.” Furthermore, Weathington et al. (2010:268) claim that “Failure to use randomization can result in sampling bias.” Likewise, Oppenheim (1992:96-97) contends that one of the causes of bias in interviewing is biased sampling. Therefore, in order to try and overcome personal sampling bias, I decided to make use of a self-completion online inventory (Bryman, 2012), where, first, the lecturers who complete the inventory were given the option to select whether they wanted to be interviewed or not (see Appendix D, Figure D.2, p.285) and, second, the interviewees chosen were selected depending on their responses given in the inventory which was administered to serve purposefully for this study. Therefore, I was avoiding “interviewer variability” (Bryman, 2012:234). In this way I minimized the risk of tainting the data with personal bias (see Appendix I). Bryman, (2012:233) suggests that “since there is no interviewer present when a self-completion questionnaire is being completed, interviewer effects are eliminated.” This is also noted by Brace (2008:29).

The online inventory was administered to all full time lecturers within the Faculty of Education at the University of Malta (N = 50) in February 2013. The inventory was returned by 35 lecturers, resulting in 70% response rate. Only 16 out of the 35 respondents accepted to be interviewed. The appropriate sample size and composition in interviews has been discussed at great length in the literature, and different recommendations have been presented (Beitin, 2012). The most common approach to sample size is theoretical saturation. However, this does not come without flaws with the main flaw being “the lack of common description of how saturation is reached” (Beitin, 2012:244). Beitin (2012) recommends that who and how many to interview should be determined by the research questions, aims of the study, time, resources and privacy issues. Consequently, in this part of the research I deliberately selected participants since “they are seen as instances that are likely to produce the most valuable data” (Denscombe, 2010:35) and this is referred to as purposive sampling. Cohen, Manion and Morrison (2011:156) suggest that for purposive sampling the researchers “build up a sample that is satisfactory to their specific needs.” Through purposive sampling I selected for interviewing six participants that varied in their responses to the web-based self-completion inventory and, instead of going for the typical instances, I focused on instances which will best illuminate the research question at hand. Denscombe (2010:35) explains that these special instances might be "extreme cases". Miles and Huberman (1994) refer to these 'special instances' as 'outliers' and they encourage their inclusion in qualitative research to get 'maximum variation' and 'strengthen the basic finding'. I specifically chose the outliers in the responses given to the web-based self-completion inventory since these were the ones that would shed more light and understanding on the research question (see Appendix B). Novak's experience based on teaching several thousand students, teachers, and professors how to interview reveals that "interviews with six to ten subjects from a given population provide essentially all of the concepts and principles that will be expressed and can serve as a basis for understanding the belief structure of that population on the questions posed" (Novak, 1998:103). The interviews were carried out in June/July 2013 and each interview lasted between 40-50 minutes.

3.9.2 Tools used to gather data

3.9.2.1 Questionnaire and inventory

Self-completion questionnaires are widely used to help educational researchers understand attitudes and the meanings that respondents give to the phenomena under study. However, Basit (2010:77) maintains that it is a misconception to consider questionnaires as an easy way to collect information rapidly and that the importance of writing a good questionnaire is very often underestimated. Furthermore, the main reason why I needed a questionnaire was to be able to purposefully select the interviewees according to their responses, therefore overcoming personal bias when selecting who to interview. During the interview I would elicit the interviewees' perceptions about different approaches to teaching, while also eliciting their perceptions about the learning process revolving around thinking, feeling and acting. From the questionnaire, I would get an idea of what kind of teaching and learning was going on in Higher Education in Malta and what the perceptions of the interviewees were regarding the learning process. Then, according to the responses, I would delve deeper through a one-to-one semi-structured interview. Therefore, I needed a questionnaire that was relevant to this research and served this purpose effectively.

The literature presented in Chapter Two, identified that two most commonly used approaches to teaching and learning within Higher Education and which have been widely accepted with little criticism (Smart & Paulsen, 2011; Coffield et al., 2004a, 2004b) are the deep and surface approaches (see Chapter Two p.73-74).

Prosser and Trigwell (1999) devised and tested an inventory (the Approaches to Teaching Inventory [ATI]) which specifically categorized deep and surface approaches to teaching so as to look "at relations between the approach adopted to teaching by the teacher, and the approach adopted to learning by the student (and the subsequent learning outcome)" (Prosser & Trigwell, 1992:468). Smart and Paulsen (2011:336) claim that "the ATI is a carefully developed instrument with good psychometric properties." Therefore, at first glance this inventory seemed to suit this study as an inventory which I could use in order to select prospective interviewees. Moreover, since it is an already validated instrument, I would be able to obtain a reliable picture of what kind of teaching and learning is going on in Higher Education in Malta within the Faculty of Education. Instead of using questions in a questionnaire, I used statements in the manner that Prosser and Trigwell (1992, 1999) had devised in their inventory. This inventory was administered in the same way as a questionnaire to the participants.

The Approaches to Teaching Inventory (ATI) is structured as two main scales referring to two specific qualitatively different approaches to learning identified as surface and deep (Prosser & Trigwell, 1992, 1999). Prosser and Trigwell suggest that the surface approach to learning has characteristics similar to those of teacher-focused strategies while the deep learning approach has characteristics similar to those of student focused strategies. In a nut shell, the teacher-focused strategies view teaching mainly as the transmission of knowledge while student focused strategies view teaching as a process of constructing knowledge leading to conceptual change. Therefore, in the ATI one finds 8 items in the conceptual change/student focused (CCSF) approach scale and another 8 items in the information transmission/teacher focused (ITTF) approach scale (see Table 3.4).

Conceptual change/student-focused (CCSF) approach		
Intention	4 items	item 6, 11, 22, 23
Strategy	4 items	item 3, 8, 12, 20

Information transmission/teacher-focused (ITTF) approach		
Intention	4 items	item 2, 5, 15, 18
Strategy	4 items	item 1, 9, 14, 17

Table 3.4: CCSF and ITTF items on the ATI inventory in Prosser & Trigwell (1999)

Each of these two approaches "are seen to be composed of two components: a strategy (or what a person does) and an intention or motive (why the person does it)" (Prosser & Trigwell, 1992:468) (See Table 3.4). The 'intention' and 'strategy' categories originate from a phenomenographic study of the conceptions of learning and teaching approaches to teaching of first year university science teachers which was conducted by Prosser and Trigwell (1992). From this study it emerged that "the intentions were found to range from one in which the teacher wants to transmit the content of the subject to the student, to one in which the teacher aims to help the students change their conceptions of the content. The strategies ranged from one in which the students are the focus of the activities to one in which the teacher is the focus" (Prosser & Trigwell, 1992:468-469). The original source of questions in the ATI was constructed from a set of interview transcripts with science lecturers. Statements or phrases were extracted from the transcripts which typified either the intention or the strategy category. Prosser and Trigwell (1992:469) discuss that "one hundred and four of these statements were selected and discussed by the researchers with the aim of reducing overlap and improving clarity." As a result, a series of item and factor analyses were conducted and the imventory has been reduced to two scales comprising four subscales – two intention and two strategy (See Table 3.4).

However, if one takes a close look at the statements of each subscale (see Appendix C) one observes that the intention revolves around the notion of knowledge which I related to cognition (thinking) as imparted by the literature review in Chapter Two. On the other hand, strategy represents what the teacher and student will do to arrive to this knowledge and, therefore, I related this to conation (action) the chorographical aspect of the knowledge construction as imparted by the literature review in Chapter Two. This perspective might also be reflected in Smart and Paulsen (2011:336):

> The teacher-focused end is called an Information Transmission/Teacher Focused (ITTF) approach. As the name implies, it emphasizes what the teacher is doing and the goal is the transmission of content. The student-focused end is called Conceptual Change/ Student Focused (CCSF) approach. The emphasis here is on what the student is doing and how to create learning environments that get students to do the sort of things that allow them to develop their own understanding of concepts.

However, this perspective is being taken into consideration only for the purpose of this study in order to be able to select interviewees without prejudice, but that would serve the aim of this second phase of the research. This led me to reflect that my inquiry revolves around not only knowledge and action but also feelings (as explained in Chapter Two) and so the ATI did not cater for this dimension. This is why I felt the need to add another subscale revolving around affectation. This subscale was added with the sole intention of shedding light upon the respondents' perceptions regarding this dimension. Subsequently, I was able to select the interviewees without personal bias, but because of their responses which served the purpose of this research. This subscale was not intended to prove statistically any kind of interaction or relationship between the three dimensions (intention, strategy and affectation). Such an analysis would require a whole research on its own, with, maybe, a reconstruction of the whole inventory, a rigorous item and factor analysis or a similar statistical test and a longitudinal study similar to what Prosser and Trigwell (1992) did, but this was not the aim either of the second phase of the research or of the whole study. However, they were helpful in shedding light upon the lecturers' perceptions about this aspect in the learning process, and the responses collected were helpful during the interview.

The statements in the newly added subscale revolving around affectation were constructed upon reflecting on the literature review as presented in Chapter Two, on my personal previous experiences dealing with the notion of feelings, and on the qualitative data collected in the first phase of this research which is presented in Chapter Four. They were also mainly constructed bearing in mind what I would have liked to elicit from the interviewee during the interview so that, according to the responses, I would be able to delve deeper into the interviewees' perceptions regarding this mental process. Moreover, the following steps from Creswell and Plano Clark (2011:189) were followed:

1. Determine what you want to measure, and ground yourself in theory and in the constructs to be addressed (as well as in the qualitative findings).
2. Generate an item pool, using shot items, an appropriate reading level, and questions that ask a single question (based on participant language when possible).
3. Determine the scale of measurement for the items and the physical construction of the instrument.
4. Have the item pool reviewed by experts.
5. Consider the inclusion of validated items from other scales or instruments.
6. Administer the instrument to a sample for validation.
7. Evaluate the items.
8. Optimize scale length based on item performance and reliability checks.

To sum up, the online inventory used in the second phase of my research consisted of 24 items, 16 of which were taken from The Approaches to Teaching Inventory (ATI) (Prosser & Trigwell, 1999) while the other 8 items were added to respond to the needs of this study. The items were scored on a 5 point Likert scale ranging from “never” to “always” (see Appendix D, Figure D.1 p.284). Before distributing the inventory among all the full time lecturers, I gave it to seven colleagues for feedback. After receiving feedback, I analysed it, and made a few adjustments to particular items on the inventory which, from the feedback response, were considered to be ‘weak’.

3.9.2.2 Administration of the inventory

An online inventory was formulated because it has several advantages. Like online questionnaires, online inventories are easier to circulate, provide a faster response, are presented through an attractive format, come at a low cost, and there are no unanswered questions since all the statements are ‘required’ to be able to submit the inventory (Brace, 2008; Bryman, 2012).

The inventory (see Appendix C) was converted into a web-based self-completion inventory using a basic Google Form (see Appendix D). All the statements were marked as ‘required’ since this was necessary for the data analysis, while personal information was marked as optional so that the respondents could remain anonymous if they chose (see Appendix D, Figure D.2 p.285). The responses submitted through this Google Form were automatically entered into an Excel data sheet (See Appendix D, Figure D.3 p.285) and, therefore, all those who preferred to remain anonymous could do so, while those who agreed to be interviewed, should the need arise, had the option to fill in their personal details.

To be able to administer this web-based self-completion inventory to all full time lecturers, I requested permission from the Human Resources Office and the Communications Office at the University of Malta and from the Dean of the Faculty of Education. The Human Resources Office sent me a list of all the full time lecturers within the Faculty of Education along with their corresponding e-mail address (see Appendix H).

An e-mail message was sent to the lecturers along with a cover letter explaining the purpose of the research and a link directed to the web-based inventory. A deadline of ten days was set and communicated in the e-mail to the lecturers (see Appendix E). Another e-mail was sent to all lecturers, as a reminder, a day before the deadline date so as to ensure the highest possible response rate (see Appendix E). This worked out effectively 35 out of a total of 50 (70%) lecturers responded to the online inventory.

3.9.2.3 Data Analysis

The data collected from the responses to the online inventory were analysed through tests of statistical significance in order to examine whether these were supported by the qualitative interpretation of the interviews that followed. “A test of statistical significance allows the analyst to estimate how confident he or she can be that the results deriving from a study based on a randomly selected sample are generalizable to the population from which the sample was drawn” (Bryman, 2012:347). However, out of the 24 items in the inventory, only 16 items which were taken from The Approaches to Teaching Inventory (ATI) (Prosser & Trigwell, 1999) were tested for statistical significance since these items were already thoroughly tested and validated (Prosser & Trigwell, 1992, 1999; Smart & Paulsen, 2011). The other 8 items of the inventory were not tested for statistical significance since these were newly added items which were used only for the purpose of my research to get an idea of the lecturers’ perceptions about affectation and as pertaining to the learning process so as to select prospective interviewees and guide my interview questions. Consequently, the added items relating to affectation were not taken into consideration for statistical purposes. Should this dimension for affectation be added for statistical purpose, it would have to be done in a completely different way, like, for example, instead of creating another subscale on its own, statements would be included in the two different categories (intention and strategy) presented in the ATI under the heading of affectation. Therefore, there would be not only intention and strategy but also feeling. In this way, one would be in a better position to analyse statistically the interaction and relationship among the three dimensions in the two different approaches (CCSF & ITTF). This would compromise another research on its own.

Bryman (2012) suggests that all of the tests have the following common structure:

- setting up a null hypothesis
- establishing the level of statistical significance that you find acceptable where the convention is that the level of statistical significance is $p = 0.05$
- determining the statistical significance of your findings by using an appropriate statistical test
- either rejecting or accepting the null hypothesis, that is to say, if the p value is greater than 0.05, the null hypothesis is accepted, otherwise the alternative hypothesis will be accepted.

(Bryman, 2012:347-348)

The null hypothesis H_0 is defined by Bryman (2012:713) as "a hypothesis of no relationship between two variables." The alternative hypothesis H_1 is the converse of the null hypothesis. Four hypotheses were set up for the second phase of this research as follows:

a) **Hypothesis 1**

H_0 : The Correlation coefficient measuring the strength of the relationship between the two variables (intention and strategy) is close to 0 indicating no or weak relationship.

H_1 : The Correlation coefficient measuring the strength of the relationship between the two variables (intention and strategy) is significantly different from 0 indicating a strong relationship that is not attributed to chance.

b) **Hypothesis 2**

H_0 : Mean scores for Intention and Strategy applications are comparable.

H_1 : Mean scores for Intention and Strategy applications differ significantly.

c) **Hypothesis 3**

H_0 : Mean scores for the Conceptual Change and Information Transmission dimensions are comparable.

H_1 : Mean scores for the Conceptual Change and Information Transmission dimensions differ significantly.

d) **Hypothesis 4**

H_0 : There is no interaction effect between Dimensions and Application

H_1 : There is significant interaction effect between Dimensions and Application.

3.9.2.4 Interview

One of the preferred methods of data collection in qualitative research is that of the one to one interview (Beitin, 2012; Kvale, 2007; Robson, 2011). Robson (2011) describes the interview as a kind of conversation with a purpose. Similarly, Kvale (1996:2) states that "an interview is literally an inter view, an inter change of views between two persons conversing about a theme of mutual interest." Silverman (2010) defines the interview as an effort used to elicit respondents' perceptions and, consequently, interviews revolve around interpersonal relationships and active interaction between the interviewer and the participants (Holstein & Gubrium, 2003). Moreover, interviews lend themselves well to be used in combination with other methods in mixed methods approach (Robson, 2011). In this study, the purpose of the interview was limited to delve deeper into lecturers' perceptions about approaches to teaching and learning within Higher Education. The responses helped to answer the secondary research question which emerged from the findings of the first phase research.

The most popularly used interview technique in qualitative research is the semi-structured interviewed (Cohen, Manion & Morrison, 2011). Kvale (2007:8) defines a semi-structured interview "as an interview with the purpose of obtaining descriptions of the life world of the interviewee with respect to interpreting the meaning of the described phenomena." The advantage of the semi-structured interview over other research tools, including the structured interview, is mainly that it allows both the interviewer and the interviewee to ask and answer questions freely without being constrained in any way by the nature of the question (Robson, 2011). The goal is to have a one to one relationship with the participants, and to understand and explore their perspectives. "The qualitative interview tends to move away from a pre-structured, standardised form towards an open-ended or semi-structured arrangement which enables respondents to project their own ways of defining the world" (Cohen, Manion & Morrison, 2011:236). Morse (2012:197) states that the semi-structured interview "consists of a question stem, to which the participant may respond freely. Probing questions planned or arising from the participants' responses may be asked."

Prompts and probes are another important aspect of semi-structured interviews. These are mainly used whenever the interviewer feels the need to encourage the respondents to explain further what they were saying and to explore individual differences in language, conceptualisation and readiness to respond. Rubin and Rubin (2012) propose that probes may have various purposes and similarly, Keats (2000:64) reveals that "probing has many functions in interpreting responses. It can be used to clarify meaning, to extend the range and quality of replies, to examine consistency, to give encouragement and to reduce anxiety." Probing is beneficial since "it gives richness to the data, allowing many individual differences in opinions and reasoning to be uncovered" (Keats, 2000:20).

3.9.2.5 Conducting the interview

The semi-structured interview was conducted with six lecturers and each interview lasted around forty-five minutes. The sequence and structure of this semi-structured interview followed the recommendations presented by Robson (2011:284) (see Appendix F).

1. Introduction: Interviewer introduces herself, explains purpose of the interview, assures of confidentiality, asks permission to tape and/or make notes.

2. Warm-up: Easy, non-threatening questions at the beginning to settle down both of you.

3. Main body of interview: Covering the main purpose of the interview in what the interviewer considers a logical progression. In semi-structured interviewing, this order can be varied, capitalizing on the responses made. Any 'risky' questions should be relatively late in the sequence so that, if the interviewee refuses to continue, less information is lost.

4. Cool-off: usually a few straightforward questions at the end to defuse any tension that might have built up.

5. Closure: Thank you and goodbye. The 'hand on the door' phenomenon, sometimes found at the end of counselling sessions is also common in interviewing. Interviewees may, when the recorder is switched off or the notebook put away, come out with a lot of interesting material. There are various possible ways of dealing with this (switch on again, reopen the book, forget about it) but in any case you should be consistent, and note how you dealt with it.

The questions revolved around four specific themes as related to my research and the literature reviewed. The four themes were, learning outcomes, learning process, deep approach towards learning and Concept Maps. The learning process and Concept Maps are themes underlying my whole research while learning outcomes and deep approach towards learning were identified in the literature review (see Chapter Two p.73-78) as two contributing factors for quality teaching and meaningful learning in Higher Education.

3.9.2.6 Data Analysis

All interviews were recorded through Audacity and transcribed verbatim before the analysis started. Concept Maps were constructed from the transcribed interviews since this facilitated the analysis and discussion. The responses in the interviews were categorised according to the themes in the questions and the responses during the interviews and the themes were represented in the Concept Maps in different colours. This procedure is common among Concept Mappers and is accepted world-wide.

While I was analysing the transcriptions, I highlighted key words which were directly related to the main theme in the question that was asked. This also gave me the possibility to omit a number of words which were superfluous. The key words were placed in a node as a concept. Each concept was then linked to another concept (keyword) either as the interviewee put it or through simple linking words that I used to facilitate comprehension for the reader.

In order to facilitate the analysis of data, each Concept Map had four themes and below I elaborated on each theme by converting the text into a CMap. I have taken different themes from different participants to increase the authenticity and trustworthiness of this exercise. The examples that follow state a verbatim quote from the interviewee and the procedure I used to convert the text into a CMap.

Example 1. Learning Outcomes: - **Participant 4 (see Figure 3.11)**

Question: What would be your main learning outcome or outcomes?

Participant 4: In my case, I always try to obtain a learning situation, where we, that is me and my students, if I can say me and my students, because I'll be one of them as well, we create a learning situation from where we share ideas and we learn together.

Question: So, can we say that your learning outcome would be learning the topic, the subject that you intend to teach?

Participant 4: Let us say that when I go for my lectures, if we were to work it out in time, usually, let's say we have a lecture of two hours, usually it is the first half an hour where I do all the talking by myself. The rest will not be based on tacit knowledge but it will actually be based on what is created there and then between us.

Question: What do you do in order to meet your learning outcome?

Participant 4: Ehm, how can I say it? I stimulate and tantalise my students in a way that they react to what I say, ehm, basically that is what I look for because once I stimulate them, once I motivate them to start talking, then we can start working together on the learning experience.

Question: Do you normally construct your learning outcome(s)?

Participant 4: Yes

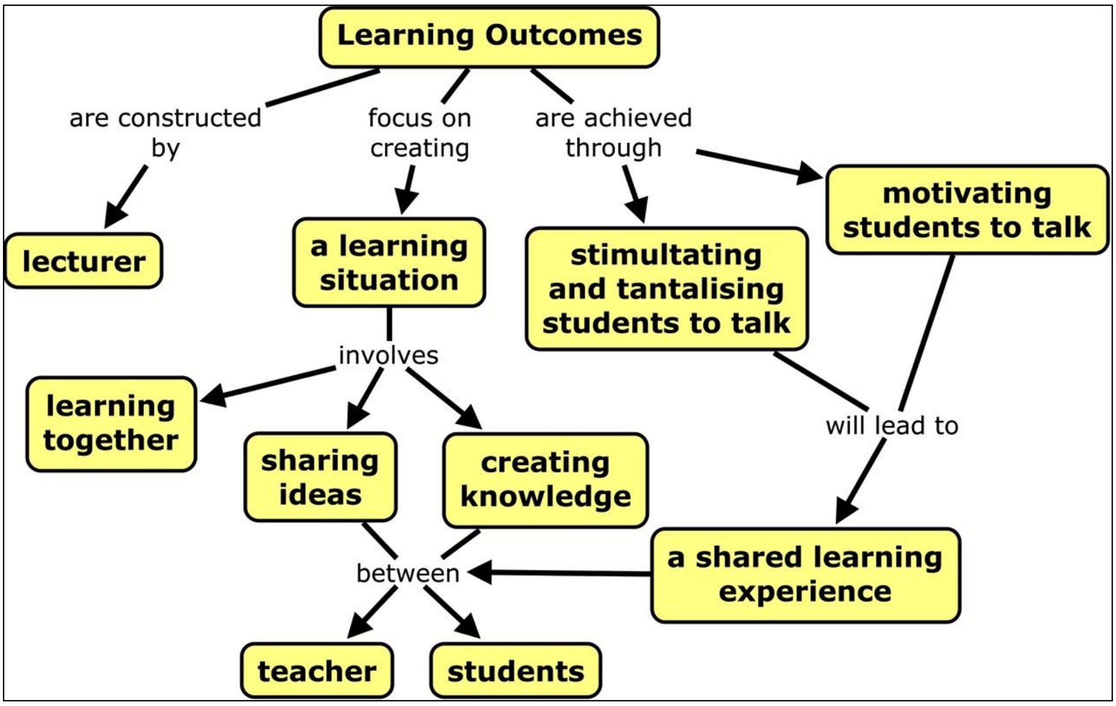

Figure 3.11: Concept Map as converted from the transcription of interview of Participant 4

Example 2. Learning Process – Participant 2 (see Figure 3.12)

Question: What aspect(s) of the learning process do you give more importance to in order for the students to achieve the learning outcomes?

Participant 2: Again, depends on the particular course. A model which I have now been working on for the past 2/3 years, I would have a paper with 3 different sections, in the first section I would simply tackle the lower level learning outcomes remembering and understanding, very short answers. Then on the second section it would be devoted specifically to theoretical and that would go into understanding and application. In the third section it would be primarily devoted to the application of theory in specific models and practices. I would want them to go into higher order thinking.

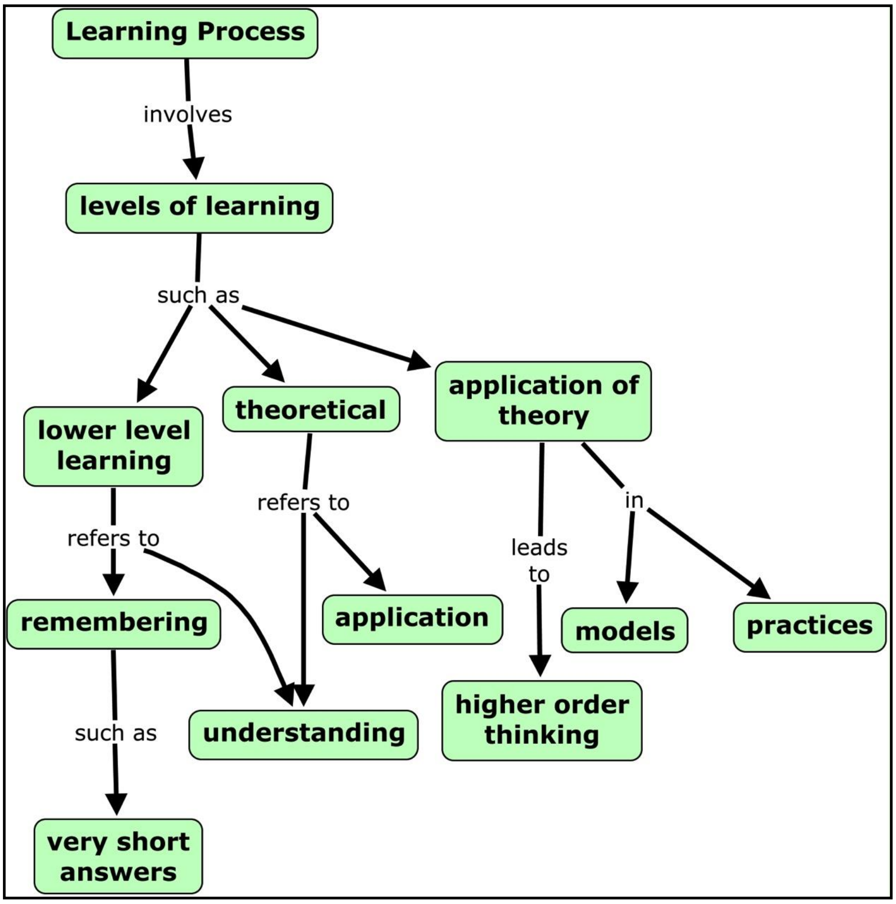

Figure 3.12: Concept Map as converted from the transcription of interview of Participant 2

Example 3. Deep approach towards learning – Participant 11 – (see Figure 3.13)

Question: From the online questionnaire that you replied to, it was very evident that most lecturers within the Faculty of Education go for a deep approach to teaching and learning, what would you recommend to lecturers within Higher Education so as to keep on improving on this practice?

Participant 11: Heq….you know…to give a deep erm….learning one has to, you know, continue to progress with the new developments in knowledge. OK? You have to… everyday you have to keep going on, you know, with this developing technology for our side….so you have to be in touch with what is going on. Alright? Erm…or else you will miss everything.

Question: And how is a deep approach manifested in your subject?

Participant 11: Deep approach is usually manifested, you know, by knowing exactly erm…the new developments in such areas for example such as electronics, alright? What's going on in electronics? How is it developing? Or resistant materials…the new materials which are being developed. So one has to be everyday in touch with these things.

Question: And the students? How do they manifest a deep approach towards learning?

Participant 11: They do, because we guide them, you know, we usually guide them and we help them a lot to keep abreast with these developments.

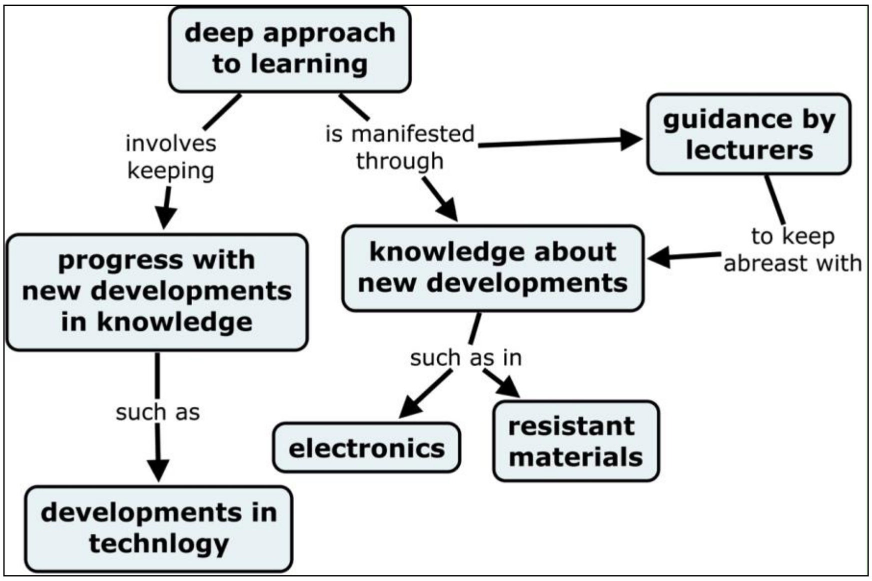

Figure 3.13: Concept Map as converted from the transcription of interview of participant 11

Example 4. Concept Maps – Participant 8 – (see Figure 3.14)

Question: Have you ever heard about Concept Maps?

Participant 8: Yes I have, I don't know enough about them but yes I have.

Question: Can you share your thoughts about them?

Participant 8: I think it's a very good way of ordering your thinking in order to ensure to achieve your goals to put it in a very abstract way. It's one effective system of ensuring that if you are dealing with an issue you're dealing with a problem you're mapping things out in a way to consider all the different options, all the different considerations because most of them are not options but they are all important considerations to arrive at a solution, a conclusion where by which you would have…… this is my idea, more as a popular notion of what concept mapping is rather than the deeper understanding that you who is an expert in this field would have.

Question: Have you tried something similar or have you tried them in your lectures?

Participant 8: In an indirect way when you have a situation for example a classroom situation when you are even considering research we engage in concept mapping that we try to map out all the different considerations all the different important notions and concepts to arrive at a comprehensive and solution… evaluation in that general way perhaps I don't know enough about this.

Question: Do you think you would be willing to use concept mapping in your lectures?

Participant 8: Yes I am open to knowing more about this of course and I think it has some appeal as long as one moves away from concepts. I am considered to be a very practical down to earth person and I think you have to start with concepts however to be to do something in a pragmatic way which is valid and reasonable.

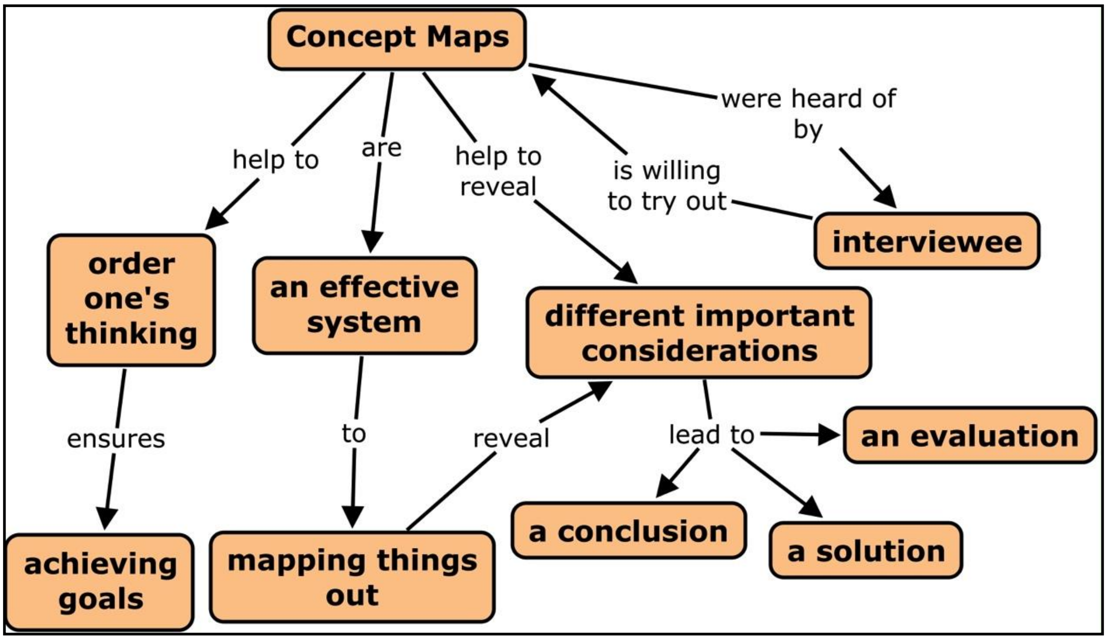

Figure 3.14: Concept Map as converted from the transcription of interview of participant 8

CHAPTER 4

FINDINGS & ANALYSIS – FIRST PHASE

Using Metacognitive Tools to Facilitate Meaningful Learning

4.1 Introduction

This chapter analyses the development of learning through the use of Vee Heuristics, Concept Mapping and Let Me Learn advanced learning system. The path that this study pursues is not to seek absolute truths or promote the pedagogical tools as quick fix learning tools but, rather, to shed light upon a pedagogical process which captures personal structures of knowledge and their development so as to generate meaningful learning. Furthermore, this whole process lends itself to the active participation of the students and creates an environment of learning where understandings are negotiated and knowledge is constructed as opposed to learners being "passive recipients of the wisdom of a single speaker" (Ramsden 2003:108). Engaging the students in active participation increases their motivation to learn and so makes them more likely to learn, retain and process the information presented (Novak & Gowin 1984; Novak, 1998; Hays, 2006; Booth, 2011). Price and Nelson (2011) suggest that when students are involved in lessons accompanied by interactive activities through the use of active participation strategies, they are also more likely to be attentive, less likely to be off-task, and more likely to feel good about their competence.

Concept Maps and Vee Heuristics were used as metacognitive pedagogical tools to reveal different cognitive structures and their development while taking into consideration the underlying processes along the way. In order to attempt to illustrate and understand why and how learners respond in a different way, I made use of the Let Me Learn advanced learning system since throughout the years this has proved to me to be an effective tool in understanding learners' preferred way of learning and how they respond to incoming information.

The next section will analyse the data collected from B.Ed. students attending an optional credit made up of fourteen hours of lectures about Education for Sustainable Development (ESD) and the learning process, which I teach at the University of Malta on a part-time basis.

4.2 Learner 1

Sequential 31 – Precision 25 – Technical Reasoning 19 – Confluence 24

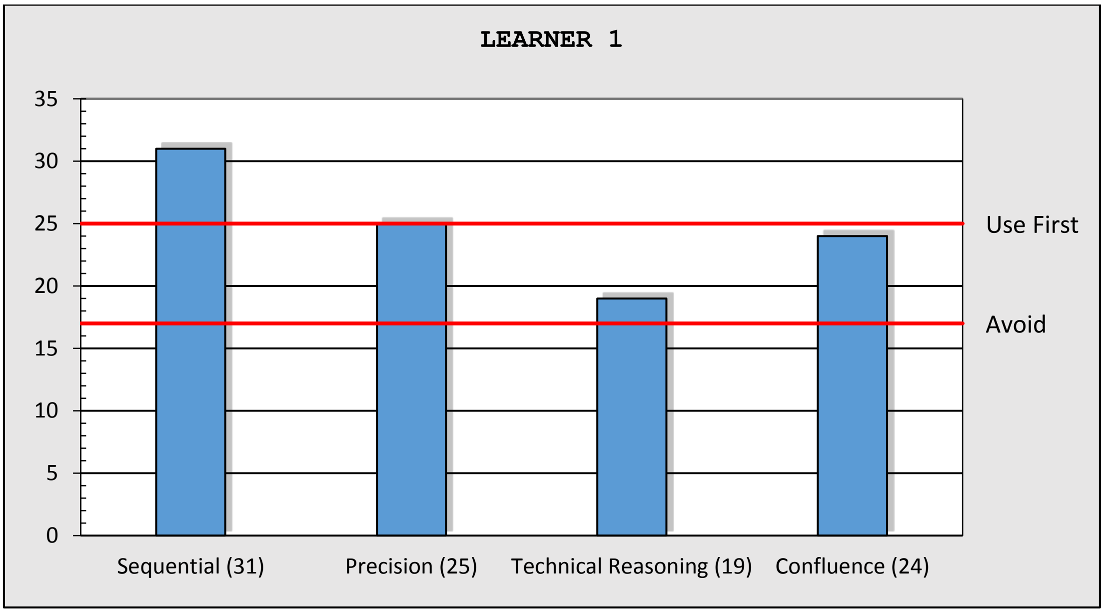

Figure 4.1: LCI score of Learner 1

This learner in the Let Me Learn lexicon is a dynamic learner (Johnston, 2005) since she Uses First two patterns and she uses the other two patterns As Needed (see Figure 4.1). From the high score in Sequence one can say that this is her dominant schema therefore this learner needs clear step-by-step directions; she prefers to see a sample of the work she is required to do since she feels more secure when she knows exactly what is expected of her. She needs time to plan, to present neat work and to double check her work. The Precise learning pattern is also within the Use First range therefore this reveals that this learner feels the need to be accurate and correct when answering questions and she attends to details especially through various readings. The Confluent pattern scores high also, however it falls in the Use As Needed range, therefore when the need arises this learner is not afraid to be different and is willing to take risks. There are only certain aspects that this learner uses from the Technical Reasoning pattern. As a result, when looking at this learner's learning pattern combination, one can deduce that this learner feels comfortable in expressing her ideas in words in an organized way, she may be creative when needed and she may also learn from real life experiences when needed.

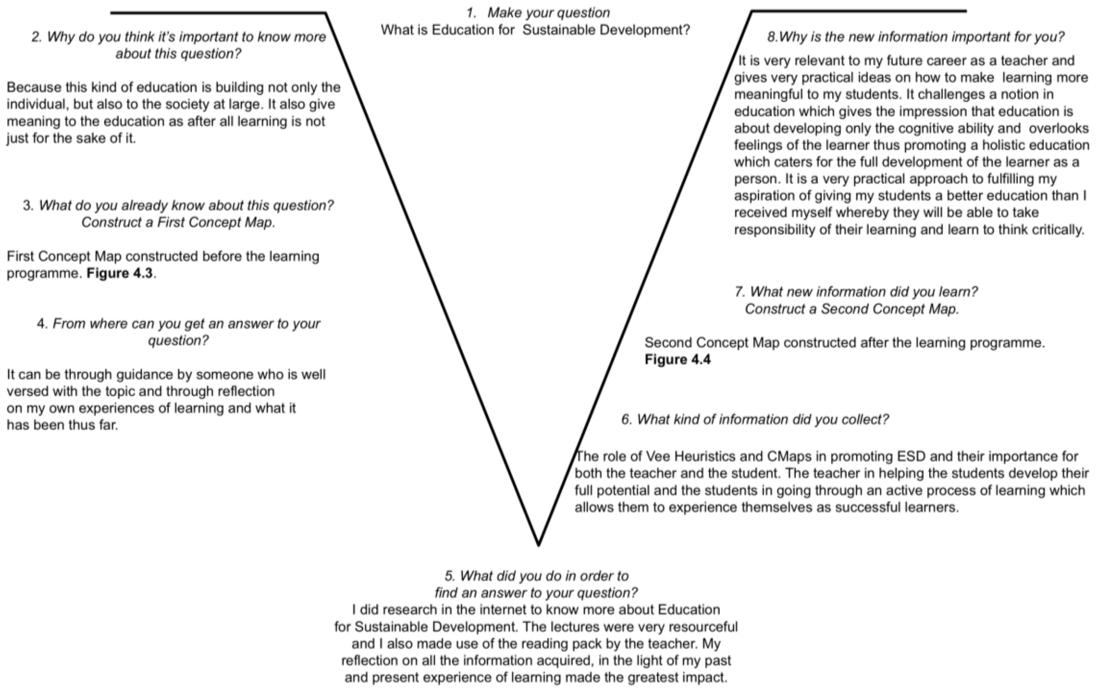

Figure 4.2: Learner 1 Vee Heuristic

The Vee Heuristic illustrated in Figure 4.2 reveals this learner's development in her thinking, feeling and acting process. There is clearly a difference between the left hand side of the Vee, which was done during the first lecture, that is prior to the learning programme, and the right hand side of the Vee, which was done during the last lecture that is after the learning programme. The information given for Question 2 reveals that this learner had very few ideas of what Education for Sustainable Development (ESD) is all about and this is corroborated by her first Concept Map constructed before the learning programme as represented in Figure 4.3. It is worth noting that this question also tries to capture the learner's feelings about the issue in question and, from the learner's response, one can deduce that this learner is very much interested in wanting to know more about the focus question. The reply in Question 2 reveals her level of motivation and interest in studying this topic and one can observe that this learner found this topic interesting and relevant to what she was studying and I found out, at a later stage during the lectures, that this student was specialising in teaching Biology.

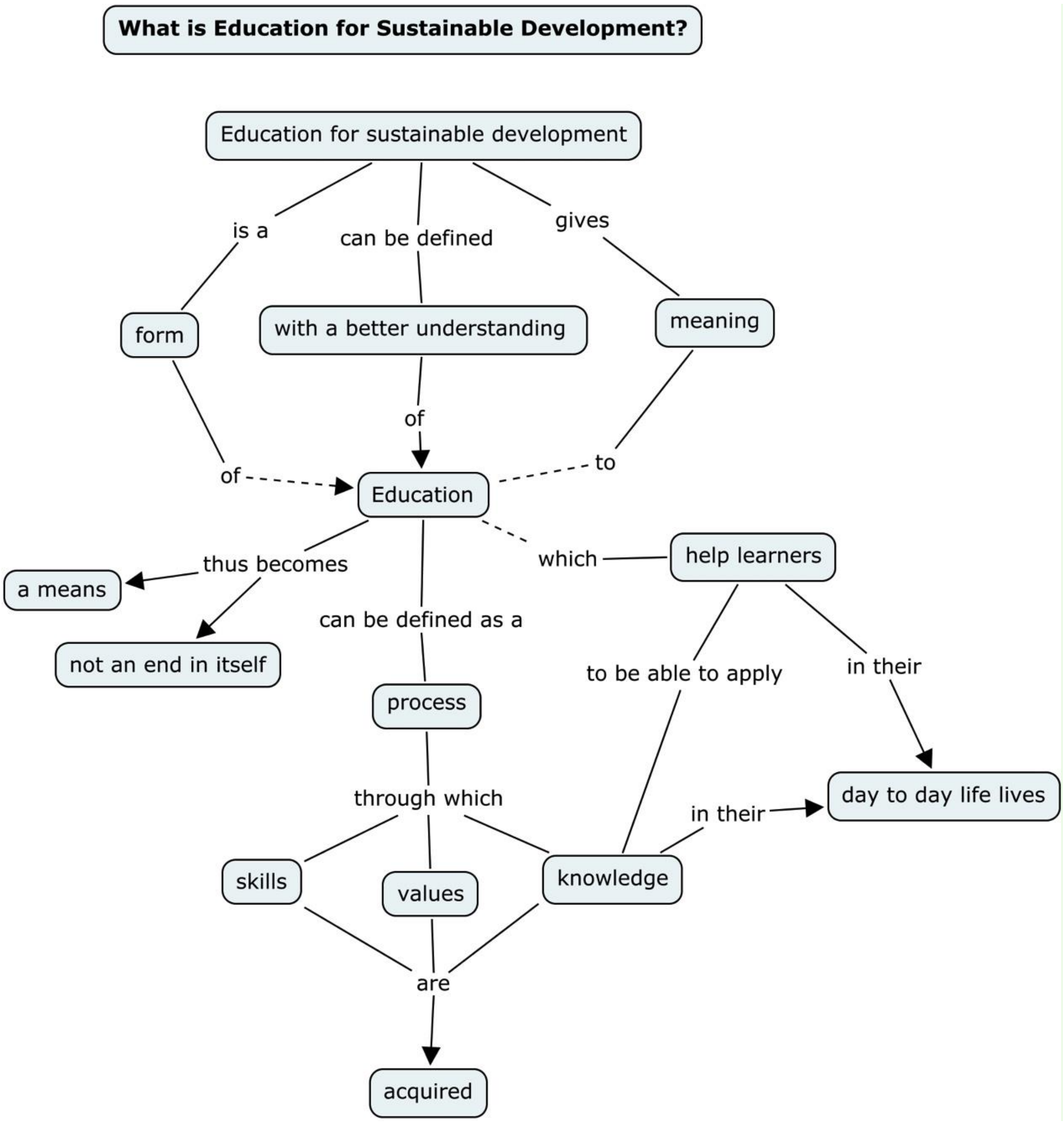

Figure 4.3: First Concept Map created by Learner 1 *before* the learning programme.

The replies given to Questions 4 and 5 illustrate how this learner planned to learn more and what this learner actually did to learn more. This learner planned to learn through "guidance by someone who is well versed in the topic" (Sequence) and she carried out research on the internet and read the reading pack (Precision) which was given so as to have more information. All of this reflects the learner's high score in Sequence and Precision. However, it is worth noting that she also planned to learn through reflecting on her experiences and this is where the Technical Reasoning pattern in the Use As Needed range emerges. Furthermore, through my personal discussion with Johnston, I found out that learners who score high in Sequence are very good at making comparisons and enjoy reflecting on the 'before' and ‘after’. This learner’s response: “My reflection on all the information acquired, in the light of my past and present experiences of learning, made the greatest impact”, reveals the high score in both Precision and Sequence patterns and certain aspects of the Technical Reasoning pattern.

From the responses given on the right hand side of the Vee one can easily observe how this learner developed her knowledge related to both ESD and the learning process. This learner gave specific details to answer Questions 6 and 8 and the new knowledge constructed is also illustrated in her second Concept Map constructed after the learning programme as represented in Figure 4.4. Moreover, the reply to Question 8, which was done at the end of the programme, reveals this learner’s feelings when compared to Question 2, which was done before the learning programme. Although the reply in Question 2 depicts a certain level of motivation, the answer is quite generalistic, whereas the reply to Question 8 is more detailed and specific, implying an increase in the level of interest and positive feeling.

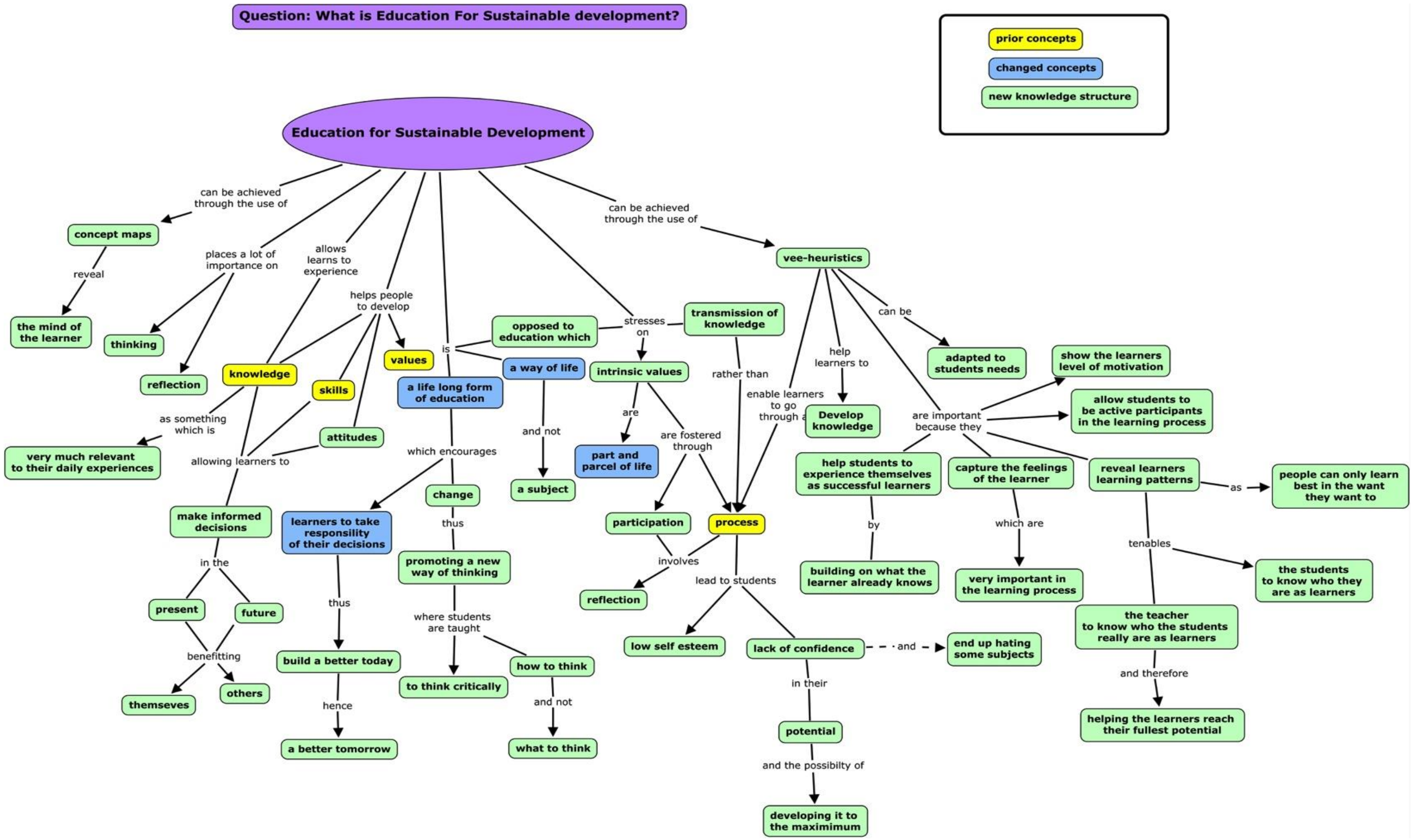

Figure 4.4: Second Concept Map constructed by Learner 1 after the learning programme.

The fact that this learner was motivated to expand her knowledge reflects her high score in Precision, “when using precision, the learner takes detailed notes, asks questions to find out more information, knows exact answers, and reads and writes in a highly specific manner. The precise pattern is our discovery pattern, “it wants to know things with certainty” (Johnston, 1998:25). This Use First pattern is also present in her four page detailed reflection where clear references to literature are made. Her Sequential pattern is reflected in the very well-organised way in which she presented her assignment and she followed closely all the instructions I had given to the students during the lectures. It is also present in her reflection when she discussed how she looked at herself as being “a product of a system of education which promotes transmission of knowledge regardless of the process of learning” and how she changed and developed herself throughout this credit:

> “This has opened my eyes and mind to a way of teaching and learning which are new to me and which I have found to provide a better teaching and learning as compared to other traditional methods of teaching which feed students with information rather than allowing them to go through a process of learning.”

Her Confluent pattern in the Use As Needed range emerged both in her response to Question 2 in the Vee where one can easily note that this learner tends to look at the big picture, and also in her reflection: “I will make use of Concept Maps in my teaching. This is because they give learners the opportunity to be active participants in the learning process.” Her Confluent pattern re-emerges often in her reflection where she tends to refer to the ‘bigger picture’ when discussing teaching and learning. For example, she suggested that the Vee Heuristics helped her to:

> give a true picture of who the students really are as learners. This will help me to cater for the needs of the students’ in my classroom, appreciate them more with their diversity and help them to develop to their fullest potential.

Her Technical Reasoning pattern in the Use As Needed range is also present in her reflection where she wrote about the relevance of this credit towards her experiences as a University student and as a future educator:

> My experience during this unit was a very positive one. I feel that this unit was helpful to me beyond my expectations when I chose it as an optional credit. I have found it to be one which touches my present life as a student and my future career as a teacher. I feel that I have been challenged and encouraged at the same time.

She also wrote how she could implement all that she has learnt in the classroom.

When observing the first and second Concept Map represented in Figure 4.3 and Figure 4.4 consecutively, one can easily note that the number of concepts and propositions has increased therefore revealing that learning has taken place (Novak & Gowin, 1984; Novak, 1998; Cañas et al., 2004, 2006, 2008, 2010, 2012; Afamasaga-Fuata'i, 2009; Correia et al., 2014). Following the criteria espoused in this research, as explained in Chapter Three (p.110-113), these Concept Maps evidence that deep learning has occurred. The first Concept Map clearly depicts a linear way of thinking as characterised in the chain and spokes (Kinchin et al, 2000) structure of the map and this contrasts with the second Concept showing a net (Kinchin et al., 2000) structure of the map revealing a change even in the way of thinking. Furthermore, she not only increased the number of concepts, but also changed and developed the original concepts constructed in the First Concept Map, while deleting all the misconceptions that were present in her First Concept Map such as "Education for Sustainable Development (ESD) gives meaning to education" and "Education for Sustainable Development (ESD) can be defined with a better understanding of education."

4.3 Learner 2

Sequential 26 – Precision 18 – Technical Reasoning 33 – Confluence 21

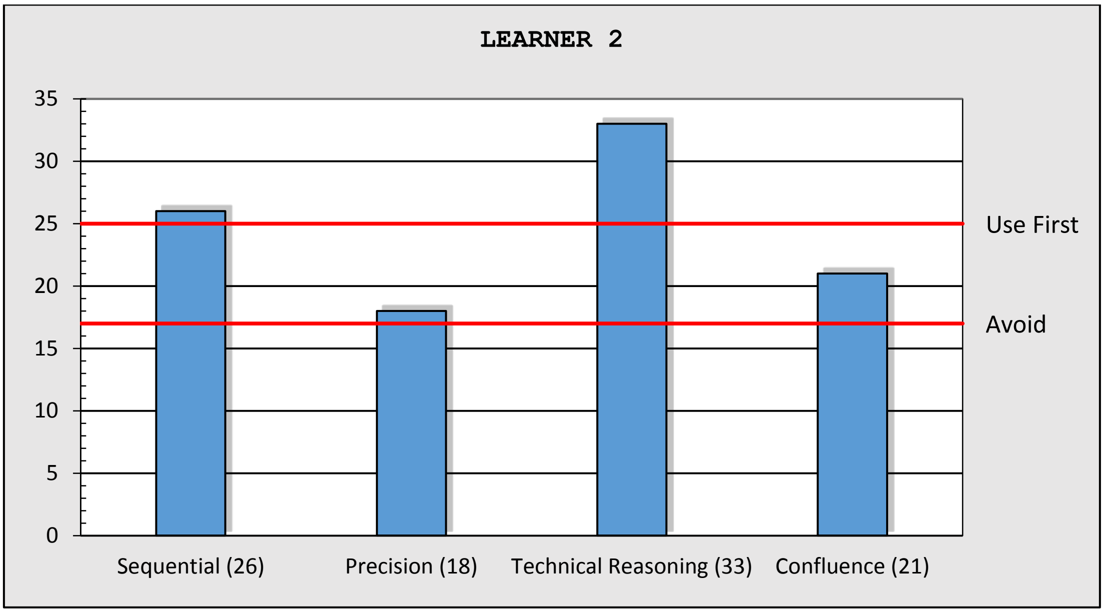

Figure 4.5: LCI score of Learner 2

The Learning Connections Inventory (LCI) score represented in Figure 4.5 exhibits another dynamic learner (Johnston, 2005) who makes use of Technical Reasoning and Sequential processing at a Use First Level. This learner uses Confluent and Precise processing As Needed (see Figure 4.5). From this kind of learning pattern, one can deduce that this learner does not like to read or write in detail, he uses very few words to express his ideas; prefers to work by himself and needs to see the purpose of what he is doing. However, he also finds it helpful when given step-by-step directions and when provided with a sample of what he is requested to do. He is willing to be different and take risks when necessary and he feels uncomfortable, if not frustrated, when given lots of details or books to read.

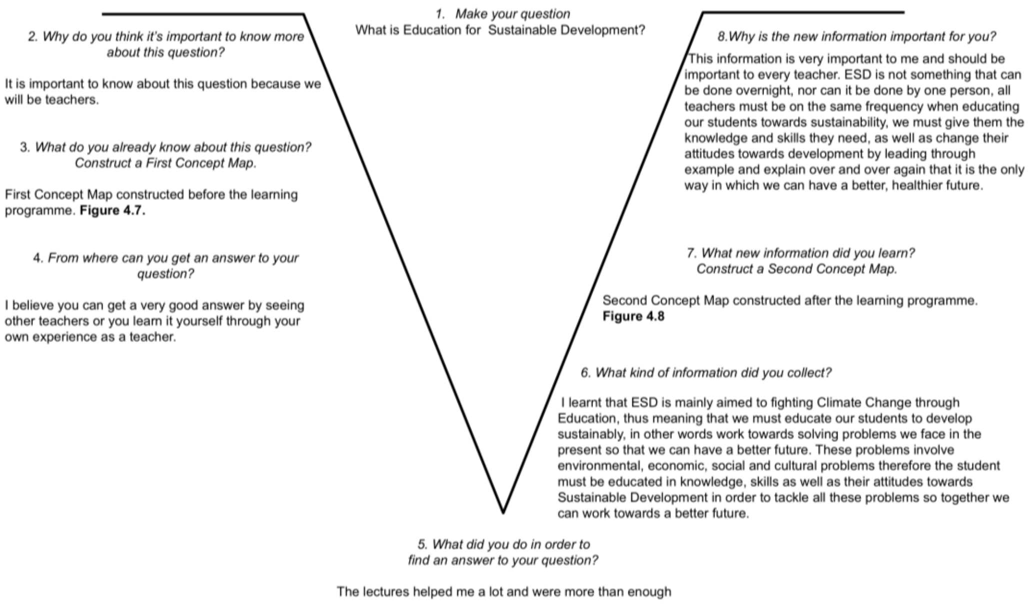

Figure 4.6: Learner 2 Vee Heuristic

From this learner's Vee Heuristic presented in Figure 4.6 one can observe a significant difference in detail between the left hand side of the Vee which was constructed during the first lecture before the learning programme and the right hand side of the Vee which was compiled after the learning programme. It is also worth noting the response given to Question 2 in the Vee. This response is quite vague and reveals the low level of motivation which this student had for this credit. Through an informal conversation I had with this student, I came to know that he chose this credit because it was the only one that did not clash with his time-table. This is also manifested in the response to Question 4 where we see this learner's uncertainty about going in for this programme. This learner was not at all planning to learn from the lectures. However, it is important to note that he planned to do his learning only through real life experiences and this reflects his high score in Technical Reasoning pattern whereas his plan to observe other teachers also mirrors the sequential pattern at a Use First level. Nowhere did he mention that he planned to read or do research to find more information and this conveys his low score in Precision.

This was very important information for me as a teacher since I took it into consideration when doing my planning for this credit. Moreover, since I score extremely low in Technical Reasoning (see Appendix K), I made certain that this learner is catered for during the planning of the programme. In reality, my combination of learning patterns (see Appendix J) directly contrasts with the combination of learning patterns as presented in this learner. Without an awareness and understanding of how learning patterns work, I would have dismissed this student as not being a ‘good’ student and, on his part, he would have been really frustrated during my lectures. On the other hand, my learning pattern combination tallies with those presented in Learner 1 (see Appendix J) and this is also another reason why Learner 1 was comfortable in my class. Vanhear and Borg (2000) argue that when the teachers’ learning pattern combination corresponds with that of the student, the student is referred to as ‘the ideal student’ whereas when the teachers’ learning pattern combination sharply contrasts with that of the student, the student is referred to as ‘an enigma’.

Although the reply to Question 5 is very short and straight forward, which is typical of learners with a dominant Technical Reasoning learning pattern, I could sense a message to the teacher, who in this case was myself. My own learning pattern combination tends to contrast with those who, like this learner, score high in Technical Reasoning and low in Precision. I score very high in Precision and very low in Technical Reason. This means that, during my teaching, I tend to give a lot of detail and a lot of extra reading, and, notwithstanding the fact that I am aware that some students might feel frustrated, especially when I give extra details, it seems that when I start lecturing, I get so absorbed in what I am saying that my natural learning patterns emerge and I overlook the fact that some students are simply not interested in extra facts. Therefore, his reply “The lectures helped me a lot and were more than enough” suggests quite a few things to me as a lecturer. First, this learner found the lectures helpful and interesting but, on the other hand, I must have overdone it with information from this learner’s point of view. It also tells me that this learner did not feel the need to go and look up more information because what I did in the lecture was ‘more than enough.’ This contrasts sharply with the Vee Heuristic presented by Learner 1 since that learner thoroughly enjoyed the extra information I provided and which she referred to stating that the ‘acquired knowledge was very important to me.’

The responses given on the right hand side of Learner 2’s Vee clearly contrasts with the responses given on the left hand side. This reveals that, through the learning programme, this learner’s motivation to learn increased. Furthermore he found this unit quite meaningful and this is proven in the reply to Question 8 where he stated: “This information is important to me and should be important to every teacher.” As we can also observe from the first Concept Map (see Figure 4.7), this learner did not have a clue what ESD meant; however, the response given to Question 6 reveals that he has grasped the meaning of ESD and this is also corroborated in his second

Concept Map (see Figure 4.8). In the response given to Question 8 one can note a sense of determination and commitment in this learner‘s tone, revealing once again that this programme might have had an impact on this learner who found himself doing this credit just by chance. It is worth noting that this learner suggests a change in his attitude towards sustainable development “by leading through example and explaining over and over again”. This reflects his Use First learning patterns: Technical Reasoning and Sequence, since he did not mention, for example, changing attitudes by gaining more knowledge (Precision) or by coming up with innovative ideas (Confluence).

This learner’s learning combination of patterns is clearly revealed in his reflection. Actually, one finds more information in the Vee Heuristic and Concept Maps than in the ten line short paragraph presented as a reflection. Although all the information given in these ten lines was correct, the sentences were very short and straight forward. Besides, I had specifically asked the students to back their reflection with some reading of the literature. This learner completely ignored this instruction and he did not mention anything other than what was said during the lectures, showing that he did not read the reading pack at all. When I gave my feedback regarding this assignment, I discussed with the learner his strengths and weakness in his assignment. He knew perfectly well what his weakness was and he even told me that this ‘problem’ was recurring in other credits and he was getting poor grades because of it, but he did not know how to overcome it. We discussed how he could overcome this problem by taking a look at his learning patterns to understand why this was happening. We decided that he should make more use of his Use First Sequential Pattern by first planning and making a list of what he would write about and then forging his Precision by at least reading parts of books or articles related to his list so that he is able to include them in his writing. I helped him understand that this was not something that he was not able to do, because it lies within him. It is just that he prefers not to do it, he avoids it. So all he needs to do is to become aware of this and, when faced with an assignment, make that extra effort to stretch those learning patterns needed to be successful in that particular assignment.

A year or so after the time this credit took place, I came across this student and we discussed his improvement in writing and, consequently, in grades. He told me that, in the final year at University, students were asked to compile a portfolio with readings, quotes etc that for them were meaningful and had left a positive impact on their learning experience. He told me that he had inserted in his portfolio the assignment presented for the optional credit because he stated that, “although I did not get the best grade, it was through that credit and that assignment that I really learned meaningfully and it helped me improve my grades in the final year." This shows how the use of metacognitive tools and processes yield meaningful learning and equip the learners with lifelong learning skills.

From the first Concept Map generated during the first lecture as presented in Figure 4.7, one can observe a Concept Map presented as a chain (Kinchin et al., 2000) revealing little or no knowledge about Education for Sustainable Development. This kind of Concept Map also reinforces the answers given to Questions 2 and 3 in the Vee illustrated in Figure 4.6. In the second Concept Map constructed after the learning programme (see Figure 4.8) one can observe a change from a linear train of thought to a net of thoughts and ideas (Kinchin et al., 2000). Although this Concept Map may have a few flaws in Concept Mapping skills, however, what is more important is that it reveals how this learner's knowledge developed. An increase in concepts and propositions is present and therefore learning has taken place (Novak & Gowin, 1984; Novak, 1998; Cañas et al., 2004, 2006, 2008, 2010, 2012; Afamasaga-Fuata'i, 2009; Correia et al., 2014). It is also worth mentioning that Figure 4.8 is what the student actually presented, i.e. that, on his own initiative and without my intervention, he analysed the "old ideas" (prior concepts), "changed ideas" (changed concepts) and the "new ideas" (new knowledge construction). This further reveals the process of reflection that this student went through. The student's own analysis demonstrates that deep learning has occurred according to the criteria set up for this analysis.

The Concept Maps illustrated in Figure 4.7 and Figure 4.8 differ from the other Concept Maps presented in this study because they lack details and this could be related to the fact that the dominant learning schema of this learner is typical of that learner who avoids details and likes to go straight to the point. However, the most salient points relating to what ESD is about are present and, therefore, the difference in these two Concept Maps reveals that this learner has learned meaningfully although he started off this programme with a lack of interest and motivation. Moreover, although this learner avoids details, this second Concept Map has more details than his paragraph written as a reflection. This might suggest that this learner found it easier to express his thoughts through Concept Mapping than through text of words. It is also worth noting the way in which the first Concept Map was constructed and the way in which the second Concept Map was created. There is a difference in colours and even in the arrows showing that this learner enjoyed constructing the second CMap more than the first one. The way in which this learning programme was presented and experienced may have helped increase this learner's interest and motivation.

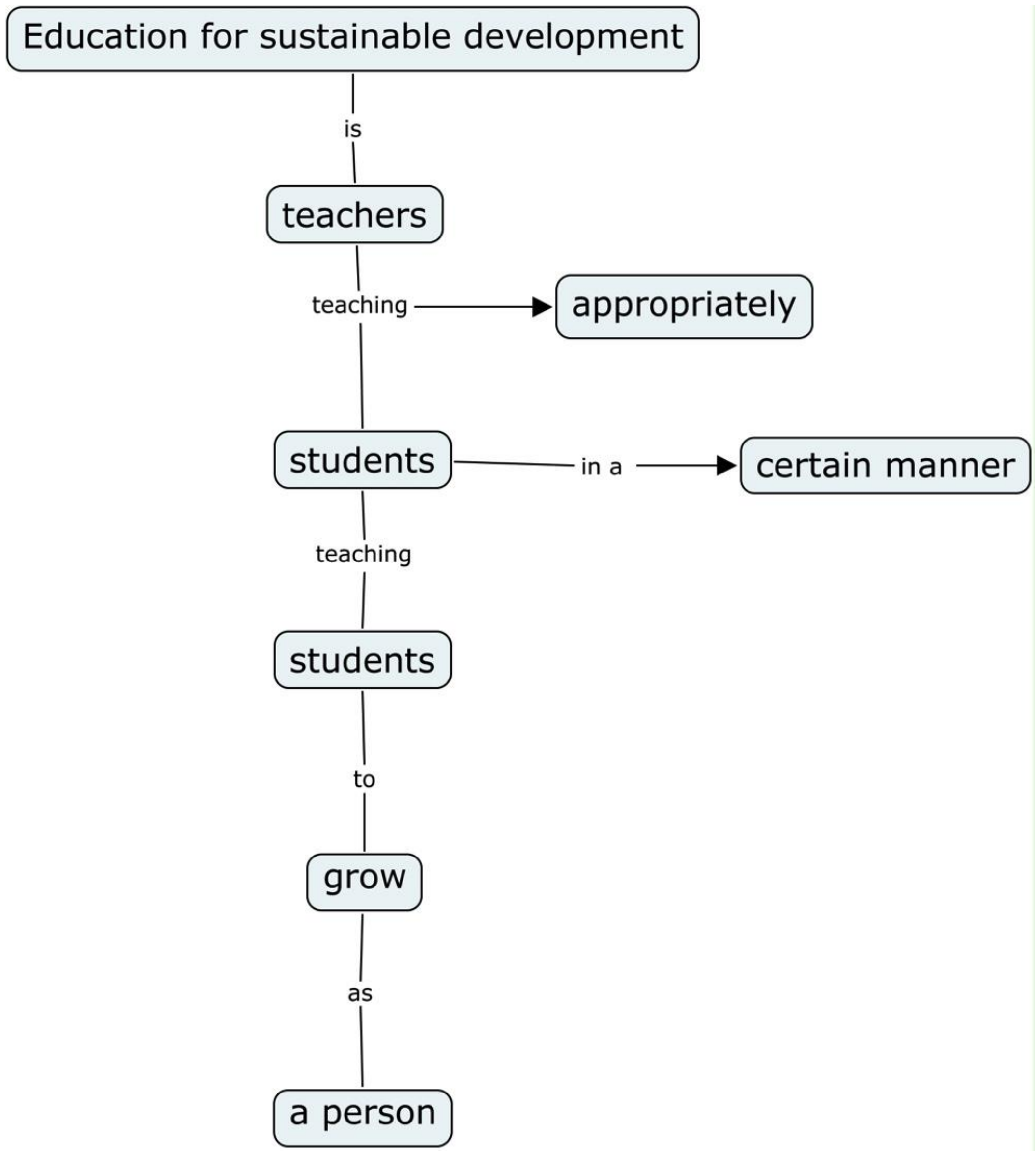

Figure 4.7: The first Concept Map constructed by Learner 2 *before* the learning programme.

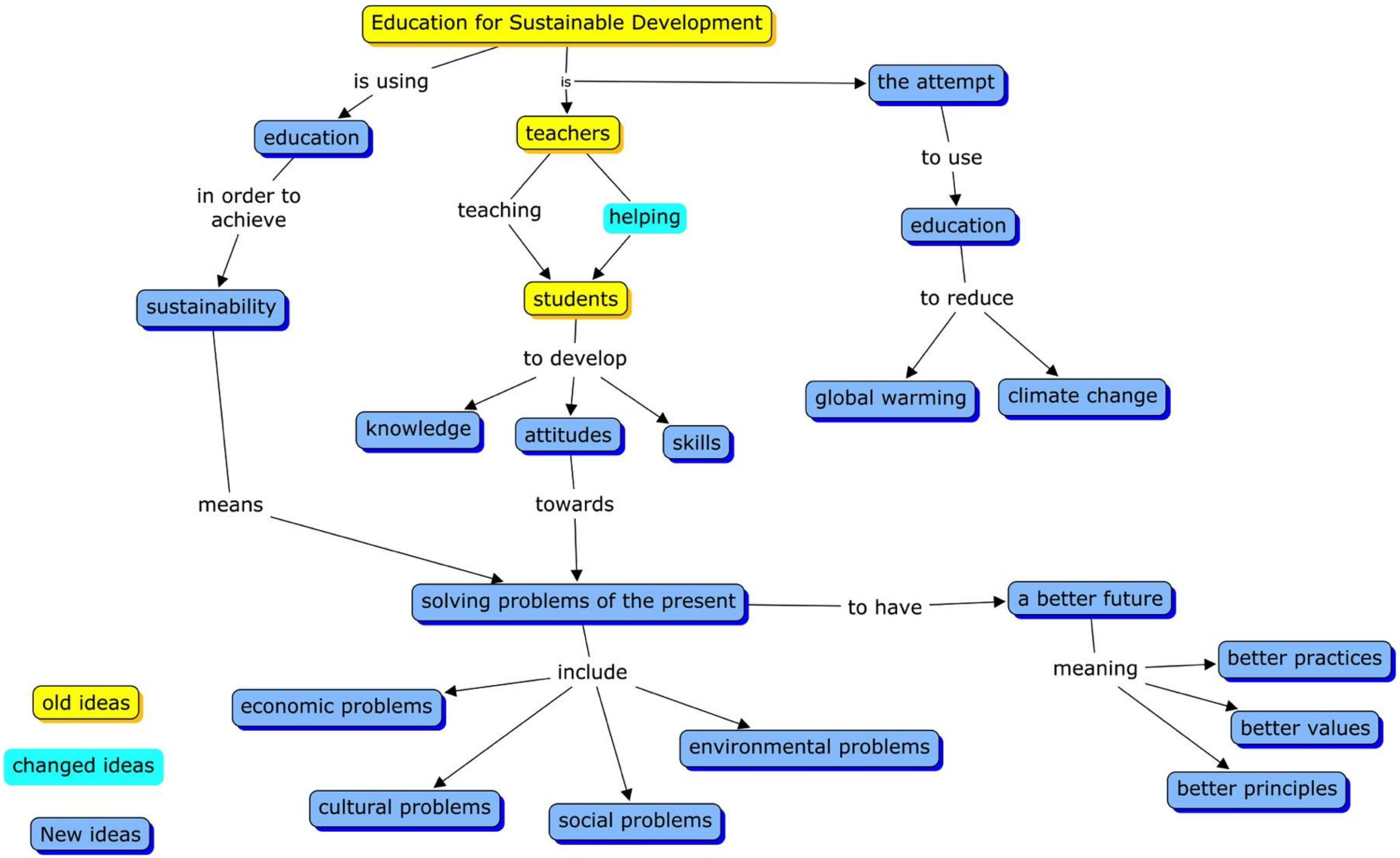

Figure 4.8: The second Concept Map constructed by Learner 2 *after* the learning programm

4.4 Learner 3

Sequential 25 – Precision 25 – Technical Reasoning 20 – Confluence 18

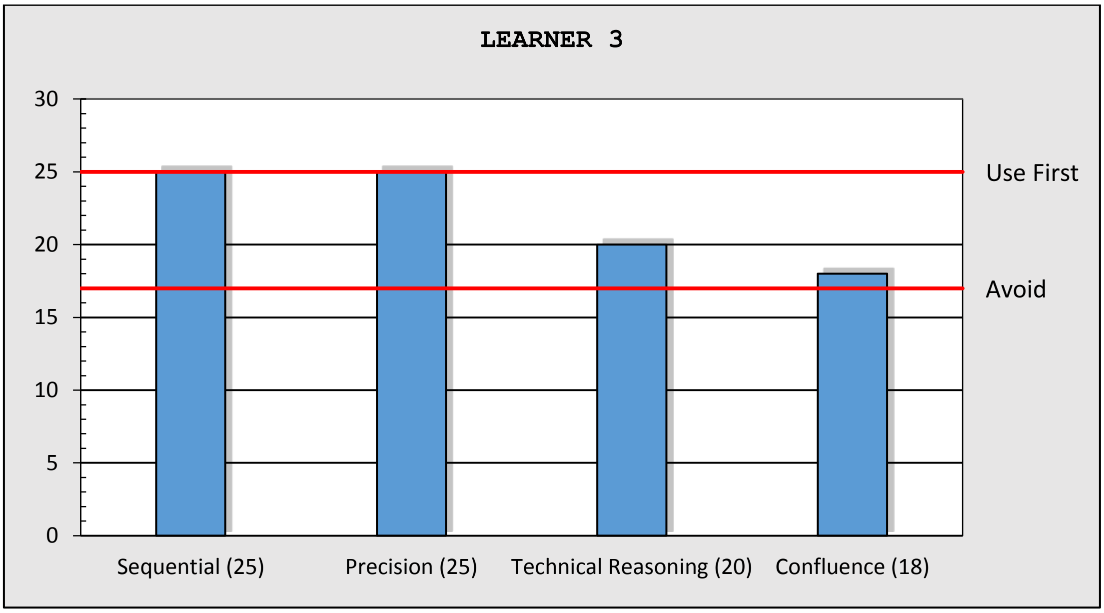

Figure 4.9: LCI score of Learner 3

The learning pattern presented above in Figure 4.9 represents a 'bridge learner' in the Let Me Learn lexicon (Johnston, 2005) since this learner avoids no learning patterns nor does she make use of any at a Use First Level but, Uses As Needed all the learning patterns. This means that this learner learns in many ways, through listening, reading and interacting with others, and she feels comfortable using all the learning patterns, depending on the task she is undertaking. This learner finds it easy to adapt to different situations and she can blend in and help make things happen as a contributing member of a group. Learners with this kind of learning pattern are very helpful when it comes to working in groups because they can serve as a bridge when conflicting patterns in other members of the group emerge. Moreover, this kind of learner tends to weigh things in the balance before they act, that is to say, they like to reflect before taking action. The development in the process of her thinking presented in the Vee Heurisitic in Figure 4.10 supports this learning pattern as explained later.

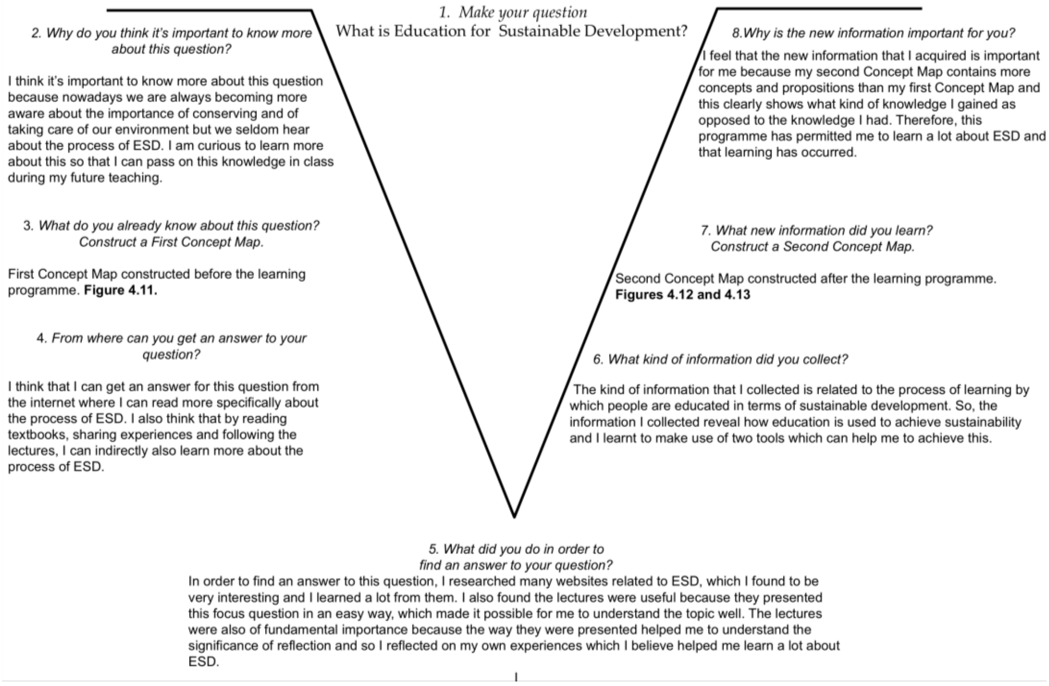

Figure 4.10: Learner 3 Vee Heuristic

During the lectures I came to know that this learner was specialising in languages as opposed to the previous learners presented here who were specialising in science subjects. I also learnt that she opted for this programme because she was late in applying for the programmes she was interested in and they were full while this programme still had some places available. The fact that she opted for this programme, and the answer given to Question 2 in the Vee show that this learner can easily adapt to new situations. Although this programme is not directly related to her specialist area and she applied for it only because it had a few places available, yet the answer in Question 2 reveals that she was 'curious to learn' and that she thought that it would still be relevant to her teaching. This opposes the view presented in the Vee of Learner 2, who applied for this programme just because it was the only one that did not clash with his timetable and, consequently, he started off with a low level of interest. Learner 3's perspective towards novel situations is very typical of bridge learners since their learning combination patterns facilitate their ways of adapting to different situations.

The replies given by Learner 3 to questions 4 and 5 further support the bridge learner's combination of learning patterns since, as one can observe, she mentioned that she intended to learn and she actually learned in different ways. Whereas Learner 2 referred to learning through experience only, Learner 3 referred to learning through reading (Precise), the lectures (Sequence) and also through experience (Technical Reasoning). None of the aspects of the Confluent pattern are mentioned here and this might reflect why the Confluent pattern has the lowest score in this combination of patterns.

From the responses given on the right hand side of the Vee one can observe that although ESD is not directly related to this learner's area of specialisation, she managed to elicit and even relate what she has learnt during this programme to her needs. This learner in her responses did not give details as regards to what she has learnt about what ESD is but her replies emphasised the learning process and the learning tools. This also emerged in her reflection where she stated:

> I also consider Concept Mapping to be an important tool since it will help me identify the students' valid and invalid ideas regarding a particular topic ...this can help me understand better which are the aspects that I should focus on in my lesson plans.....Concept Mapping will help me become a more effective teacher.

In her reflection she also mentions that Vee Heuristics "will help me organise myself as a teacher in a way where I will enter into a relationship with my students."

If one compares the responses given to Question 2 (left hand side) and Question 8 (right hand side), one can observe that although this learner started off with a certain level of motivation and a curiosity to learn, this increased as she was reflecting and applying what she had learnt throughout the learning programme.

The organised and systematic way in which the assignment was presented reveals that this learner likes to make use of her Sequential learning pattern and her long reflection was backed with literature sustaining her Precise learning pattern. The assignment was generated according to my instructions and this further proves the dominant use of the Sequence and Precise learning pattern as revealed by the high scores in these patterns in the LCI. The Technical Reasoning pattern emerged in her reflection, where she described how she intended to implement the use of Vee Heuristics and Concept Mapping in her teaching.

The combination of this learner's learning patterns emerged clearly in her reflection, where she wrote in detail about her personal reflections:

> I have discovered that I have grown a lot, both as a person as well as a teacher...I learned one major thing about myself: before, I used to give more importance to the academic content of my lessons, but now I have discovered that I should start giving more importance to how I deliver this content to my students, because if I deliver it in a way which doesn't appeal to them, no academic content will be passed on to them.

It is also worth mentioning how such learners tend to reflect and put everything on balance before acting, and how this emerged also in her reflection when she wrote that she is going to implement these tools in her teaching but “I’m aware that it will not be an easy task, due to the lack of time that teachers have due to the vast syllabuses.”

The first Concept Map constructed before the learning programme and the second Concept Map constructed after the learning programme are presented in Figure 4.11 and Figure 4.12 consecutively. Here again the first Concept Map (spoke and chain structure) reveals that this learner did not know what ESD is all about and we can see a significant change and a development in her ideas and concepts in the second Concept Map (net structure). Actually, the number of concepts and propositions increased therefore showing that learning has taken place (Novak & Gowin, 1984; Novak, 1998; Cañas et al., 2004, 2006, 2008, 2010, 2012; Afamasaga-Fuata’i, 2009; Correia et al., 2014). Furthermore, the First Concept Map is displayed in a chain and spoke structure conveying limited understanding while her Second Concept Map developed into a net structure revealing meaningful learning (Kinchin et al., 2000).

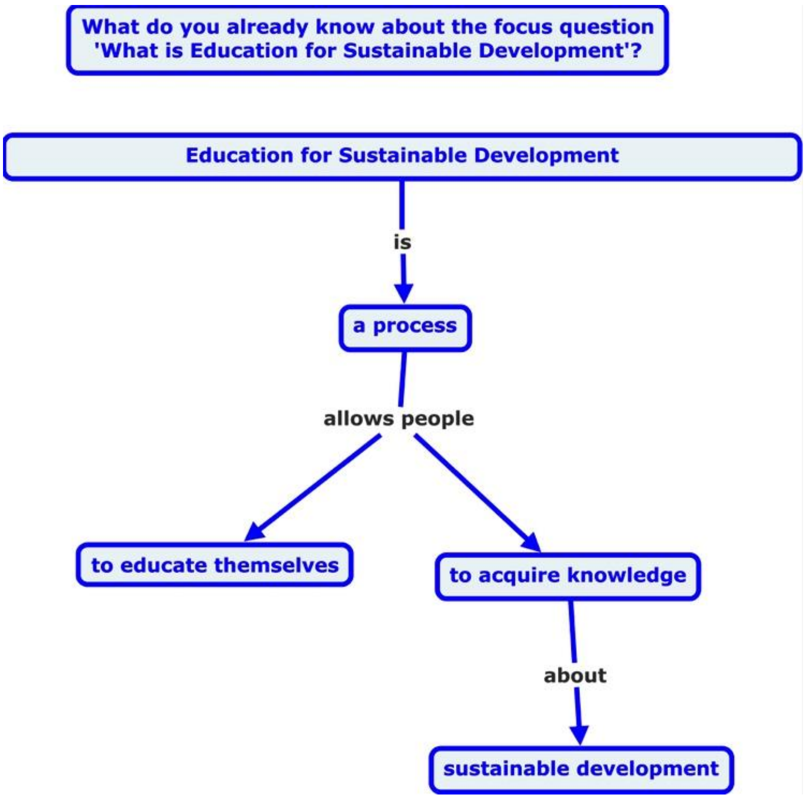

Figure 4.11: The first Concept Map constructed by Learner 3 ***before*** the learning programme

On analysing the second Concept Map presented in Figure 4.12, one may state that deep learning has occurred according to the criteria presented for this analysis. Furthermore, in Figure 4.13 one will find the second Concept Map as presented by this student in her assignment. The yellow nodes depict that this learner has also undertaken a reflective exercise where she evaluated her own knowledge construction and development as compared to the first Concept Map.

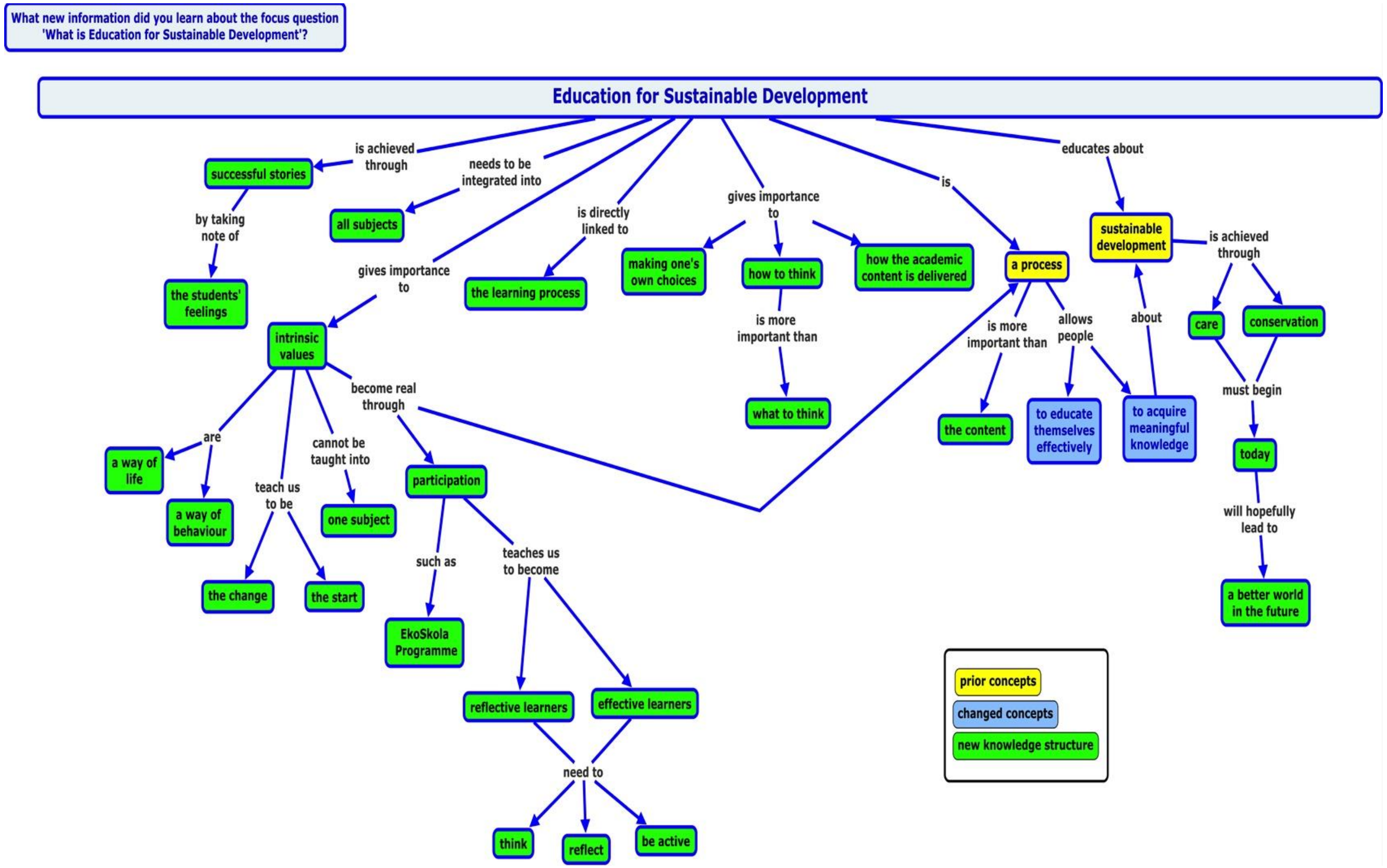

Figure 4.12: The second Concept Map constructed by Learner 3 after the learning programme

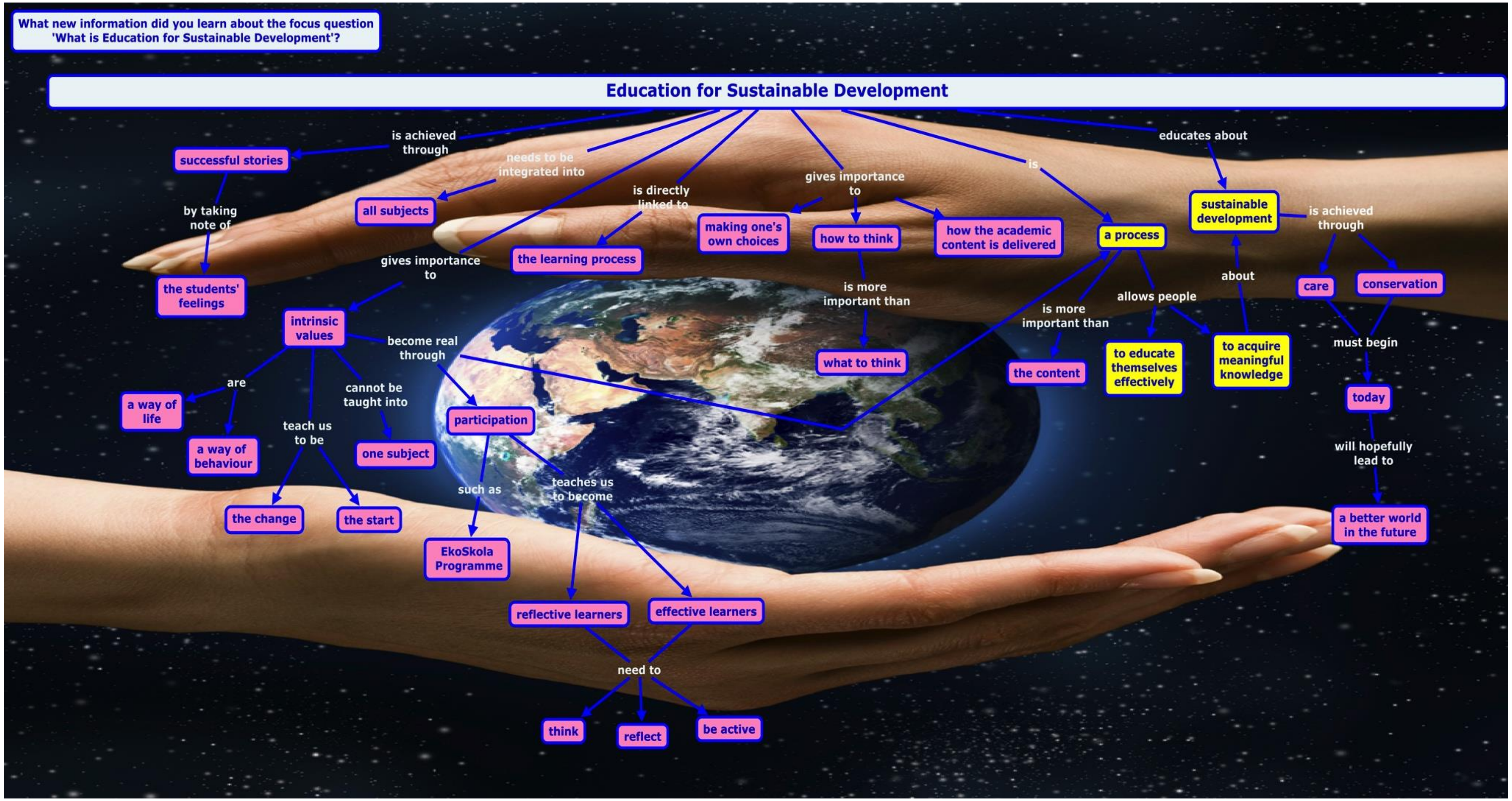

Figure 4.13: The second Concept Map as presented and constructed by Learner 3 after the learning programme

4.5 Learner 4

Sequential 28 – Precision 29 – Technical Reasoning 34 – Confluence 28

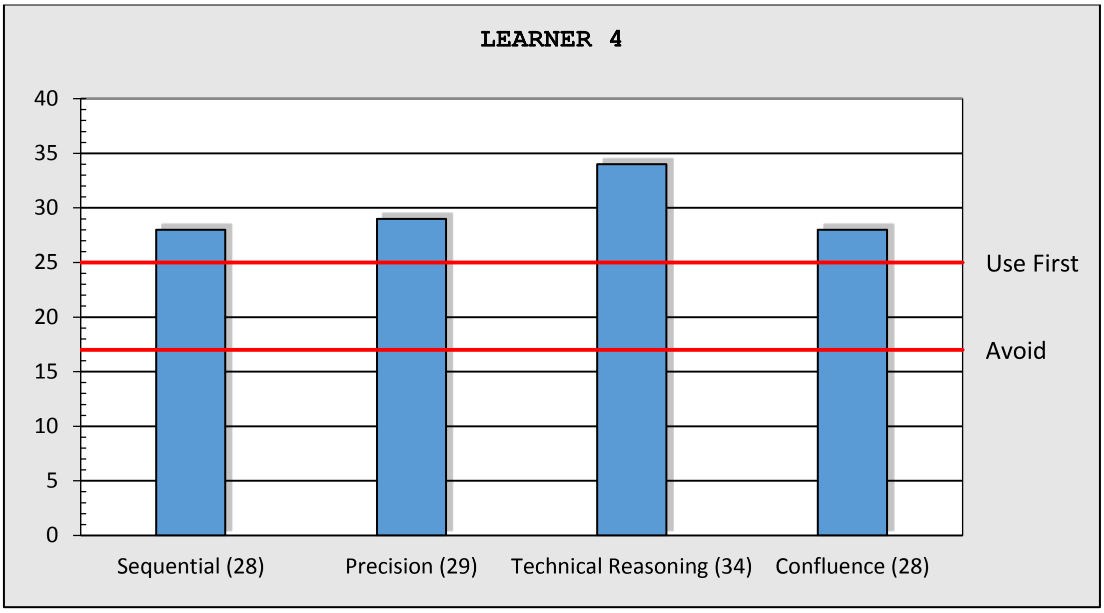

Figure 4.14: LCI scores of Learner 4

When learners score high and therefore Use First three or more patterns, they are considered to be strong-willed learners in the LML lexicon (Johnston, 2005). Therefore, the LCI scores exhibited above (see Figure 4.14) demonstrate that this learner is a strong-willed learner since he scores high in all of the patterns. The highest score is in Technical Reasoning followed by Precision and Sequence and Confluence which have the same score. So, the dominant schema of this learner is led by the Technical Reasoning pattern where he makes use of language which mainly revolves around operational terms. This kind of learner likes "to take things apart just to see what makes them tick....and put them back together without any leftover screws" (Johnston, 1996:53). Consequently, it comes as no surprise that this learner happens to be specialising in Technical Design and Technology.

However, the high score also in the other patterns reveals that this learner has his own team and he may use the other patterns with ease when this is required. As a result, this learner is able to learn from real life experiences, but also from books, since he enjoys getting to know lots of facts and details while at the same time he can be very organised and creative. This learner can control his own process of learning and he prefers to work alone so that he is able to control the plan, the ideas, the talk, the decisions, the process and the outcomes (Johnston, 2010).

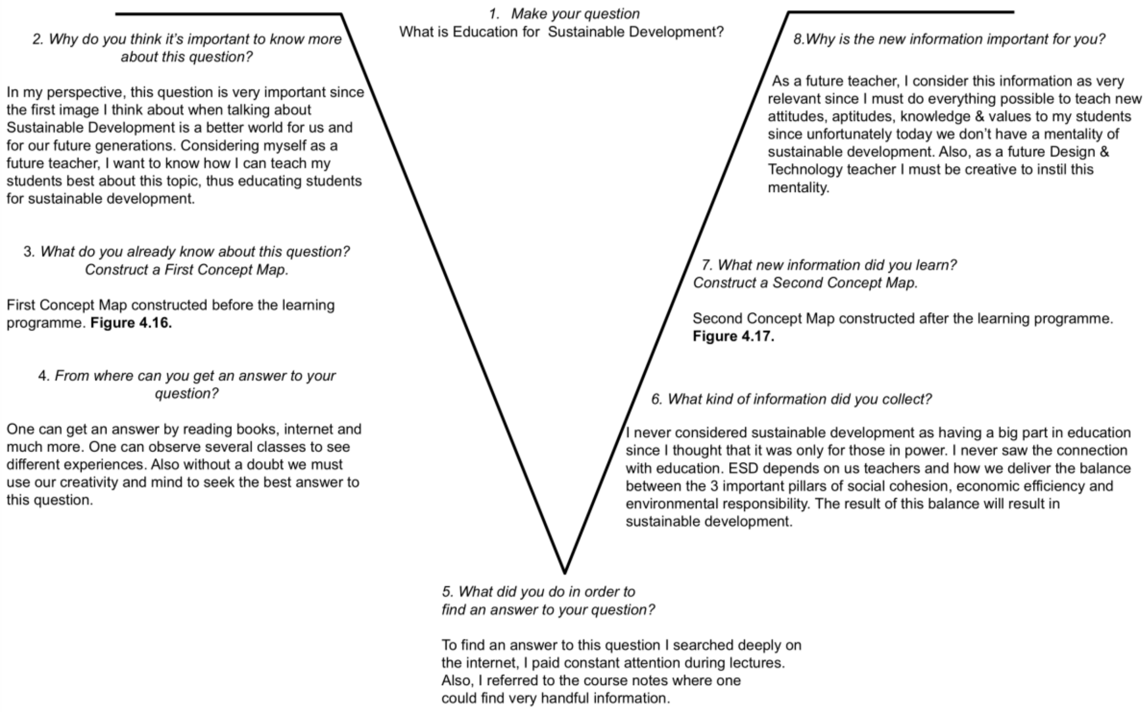

Figure 4.15: Learner 4 Vee Heuristic.

The Vee Heuristic displayed in Figure 4.15 reveals the development and process of thinking, feeling and acting of this strong willed learner. The left hand side of the Vee constructed before the learning programme exhibits the learner's level of feeling, his prior knowledge and how he is planning to learn more about the topic under study.

The answer given to Question 2 reveals that this learner only had a general idea about ESD and this is corroborated through his First Concept Map presented in Figure 4.16. However, it is worth noting that he found this topic relevant to his future profession and, therefore, he was curious to learn more. As reviewed in the literature presented in Chapter Two, various authors suggest that many times curiosity is "for its own sake" motivation and enhances the learning process (Dewey, 1913; Brophy, 2010; Ryan, 2012). This learner's reply "considering myself as a future teacher, I want to know how I can teach my students best about sustainable development", reflects this learner's dominant schema of Technical Reasoning since this kind of learners are intrigued by relevance of the topic under study. They act to find how they can make it work and through this build their self-confidence. This is consistent with how Johnston (1998:27-28) describes learners who score high in Technical Reasoning.

Therefore, the reply given to Question 2 conveys very important information to the teacher; it not only reveals the level of motivation of this learner but also why and where this motivation is coming from. One of the requirements for meaningful learning to take place as presented by Novak (1998) (Chapter Two, Figure 2.9 p.62) is how the teacher will deliver the selected material to be learnt in a way which makes sense to the learner, and, from the reply to Question 2, the teacher is aware how relevant the topic under study is for the learner and can thus, plan the learning programme accordingly.

Learner 4's strong-willed high score in all the learning patterns is reflected also in the replies given to Questions 4 and 5. To Question 4 he replied that he intends to learn through a lot of reading (precision pattern), observation (sequential pattern), experiences (technical reasoning pattern) and creativity (confluent pattern) (Johnston, 1998, 2005). This reply contrasts, for example, with the reply given by Learner 2 (p.141). Whereas Learner 2 planned to learn only from real life experiences (Technical Reasoning pattern) and observations (Sequential Pattern) since he Uses First only for these two learning patterns, Learner 4's high score in all the patterns as presented in this paragraph, mentioned more different ways through which he can learn.

At this point I would like to make a short but very important observation. LML speaks about a combination or connection of the learning patterns and does not put learners into just one category unlike many other learning styles that usually compartmentalise the learners (Coffield et al., 2004a, 2004b). Although Learner 4's dominant schema is Technical Reasoning, there are the other patterns which follow closely behind this dominant schema and this was revealed from the analysis of the responses and the written reflection. Therefore, the combination of all four learning patterns affects this learner's preferred way of learning since one is "never only one Pattern" (Johnston, 2010:51). On the other hand, Learner 2 (p.140) makes use of the Technical Reasoning as a dominant schema; however, since he scores lower in the Confluent pattern (a 21 score on the LCI) and lower in the Precision pattern (an 18 score on the LCI), this combination of patterns affected the way he preferred to learn and this was reflected in the analysis of the responses given (see p.141-143 and Figure 4.6) and in his written reflection (see p.143). This is the reason why in LML, the learners are viewed according to the degree to which each pattern is used and which is revealed in the LCI; as Johnston (2010:36) states "everyone uses each of these patterns to some degree." While Learner 2 also focuses on real life experiences which are relevant to him, however, he does not like a lot of details as explained on p.140 and this mainly emerged in his short ten-line paragraph as a reflection. Whereas, although Learner 4 scores high in Technical Reasoning and therefore he also gives a lot of importance to relevance to real life experiences, he also scores high in the other patterns and this was reflected in his detailed six-page long written reflection. This is one of the reasons why I personally prefer LML to any other learning style, since it gives you the degree to which each learner is making use of each of the learning patterns. With this awareness, the teacher can guide that particular student to use intentional strategies to stretch a particular learning pattern in order to perform successfully in any given task as explained in Appendix A (see Appendix A.9 p.271-274). Furthermore, both the teacher and the student will acquire an awareness as to why a particular student is not being successful in a particular task, and will be able to respond to this in an effective way. In this way, students and teachers negotiate thoughts, feelings and actions which would eventually lead to learning. This is the kind of agentic engagement that is proposed by Reeve (2013).

The responses given on the right hand side of the Vee reveal the new knowledge construction and how this was integrated within the student's prior knowledge. This is confirmed in the Second Concept Map created after the learning programme (see Figure 4.17) and is also reflected in his reply to Question 6 particularly when he states "I never considered Sustainable Development as having a big part in education since I thought that it was only for those in power. I never saw the connection with education." The response given to Question 8 also exhibits the positive feeling of this learner and this is reflected in his commitment to do "everything possible" to instil a sustainable development mentality in his students.

In the reply given to Question 8 we once again note the importance of 'relevance' to this learner implying his dominant schema of Technical Reasoning, and that is why it is not surprising that this learner opted to choose Design and Technology as his subject specialisation. The high score in all the learning patterns revealed in the LCI are also reflected in his six pages long written reflection which were full of details with valid and various literature references (Precision pattern). His assignment was very well organised and presented with clear headings for sections and sub-sections, title page, set margins with headers and footers and a coherent sequence and progression of ideas (Sequential pattern). Throughout the reflection there were various references to personal experiences (Technical Reasoning pattern) and links between what he is learning and his own experiences such as: "reflecting on my own experience as a student, I always wished that my teachers understood my feelings and my self-confidence."

His high score in the Precision pattern emerged also in the fact that he was the only student to refer in detail to the three requirements for meaningful learning to take place:

> in order to have the green light for meaningful learning, we must satisfy three conditions. First we must have relevant prior knowledge, where the learner must know some information that relates to the new information to be learned. The second condition is that we must have meaningful material where the knowledge to be learned must be relevant to the student. Finally, the learner must choose to learn meaningfully, and thus the learner must choose to relate new knowledge to pre-known knowledge.

His Confluent pattern emerged in the way that he showed a readiness to take risks and a willingness to implement the new ideas learned in this learning programme. This is reflected in the following comment:

> Learning could be enhanced by using different educational tools, such as Concept Mapping and knowledge Vee-Diagramming; the principal two tools which I've learned during this study unit and which I intend to use in my classroom…..In my opinion I must make use of Constructivism, where I will have my students construct knowledge for themselves throughout the scholastic year and this will basically improve active involvement…….as a future teacher, I will make my students evaluate the content, sort it and critically analyse it rather than just memorizing it.

A comparison between the First Concept Map represented in Figure 4.16 and the Second Concept Map represented in Figure 4.17 reveals that the number of concepts and propositions has increased and therefore learning has taken place (Novak & Gowin, 1984; Novak, 1998; Cañas et al., 2004, 2006, 2008, 2010, 2012; Afamasaga-Fuata'i, 2009; Correia et al., 2014). The concepts in Figure 4.16 are displayed in a spoke and chain structure suggesting a limited conceptual understanding (Kinchin et al., 2001). However, these were developed into a net structure demonstrating a deep understanding of the topic. The Second Concept Map (see Figure 4.17) also shows that according to the criteria set for this research (see Chapter Three, p.110-113) deep learning has taken place.

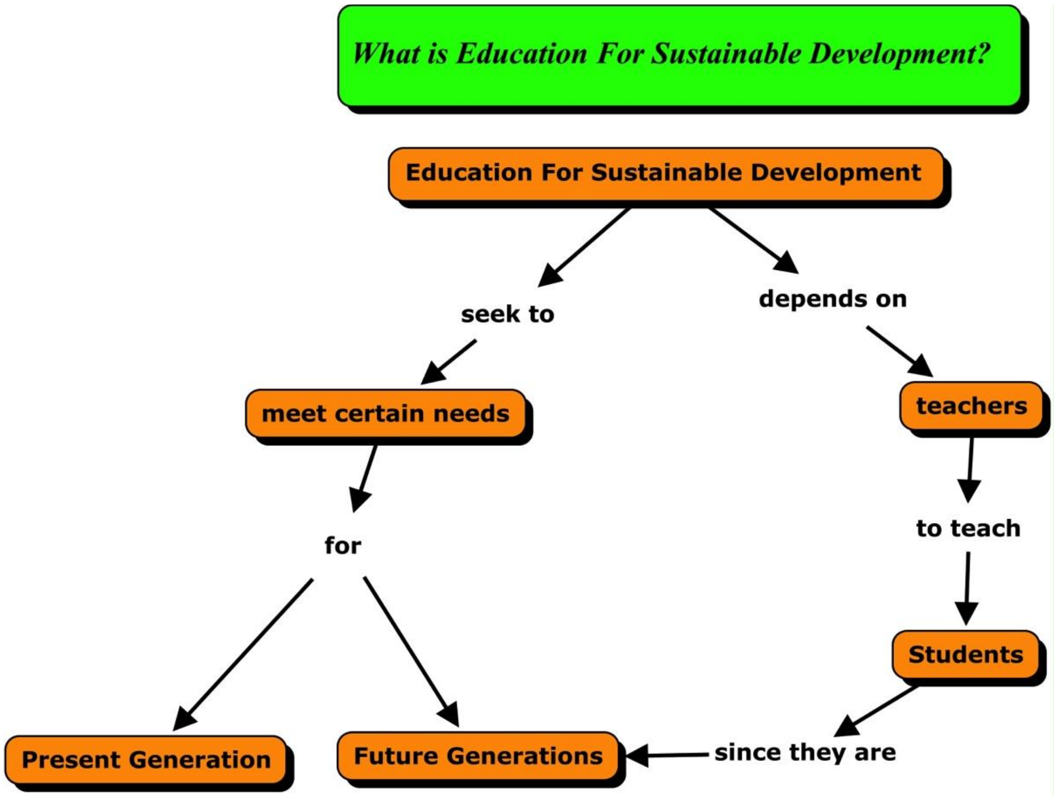

Figure 4.16: Learner 4 First Concept Map constructed before the learning programme.

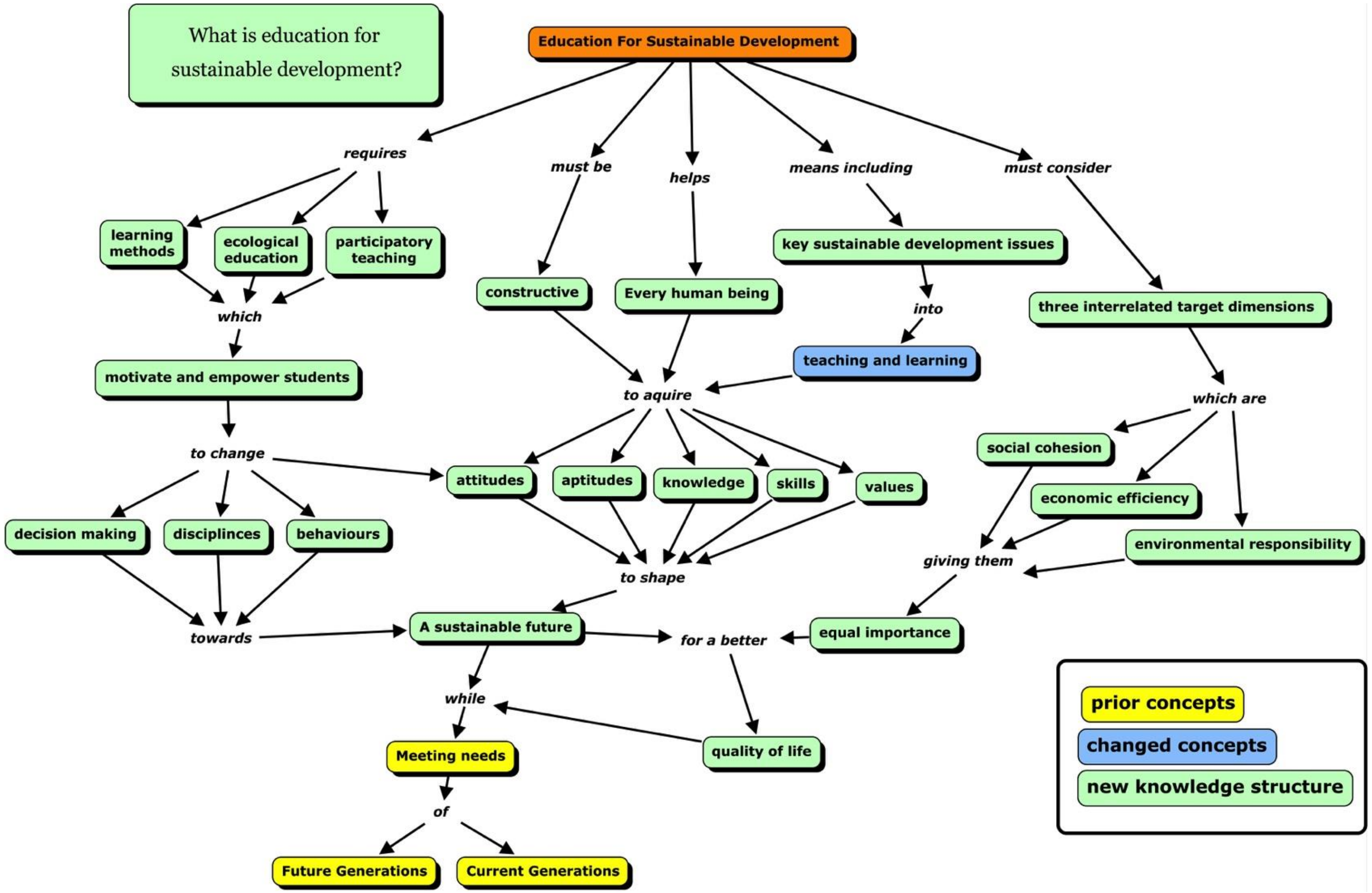

Figure 4.17: Learner 4 Second Concept Map constructed after the learning programme.

4.1 Learner 5

Sequential 31 – Precision 28 – Technical Reasoning 16 – Confluence 16

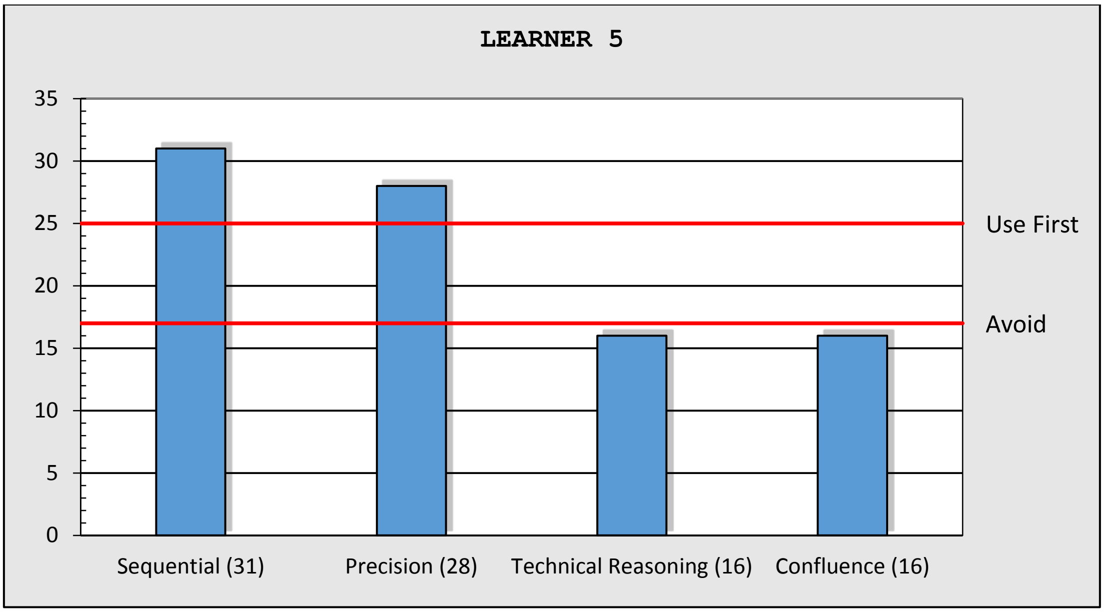

Figure 4.18: LCI scores of Learner 5

This learner is another dynamic learner who Uses First two learning patterns while the other two of her learning patterns fall within the Avoid range (Johnston, 2005). I selected this particular learning combination since unlike the other dynamic learners presented in this analysis, this learner does not make use of any pattern within the Use As Needed range. She Uses First the Sequential and Precise patterns while she Avoids the Confluent and the Technical Reasoning patterns (see Figure 4.18). This means that Learner 5 needs instructions which are broken down into small steps; she wants to do her work neatly and feels frustrated when she does not have enough time to present her assignment or task in an organised way. She wants to know and does her utmost to meet the teacher's expectations. She also tends to want thorough explanations and asks a lot of questions, especially to check that she is on the right track with her work. She likes details and she prefers to write and make use of words to show what she has learnt. On the other hand she avoids hands-on tasks and does not like to work alone since she feels more comfortable and secure doing what most of the others are doing. She would feel more comfortable when given a sample showing what is expected of her. She avoids taking risks and prefers her work to be as accurate and as correct as possible. The Vee Heurisitic of Learner 5 is displayed in Figure 4.19. The information given in this Vee reinforces this learner's preferred way of learning as revealed in the LCI scores (see Figure 4.18). Furthermore, the left hand side of the Vee reveals also why this learner wants to know more about this question, her prior knowledge about the topic under study and how she is planning to learn.

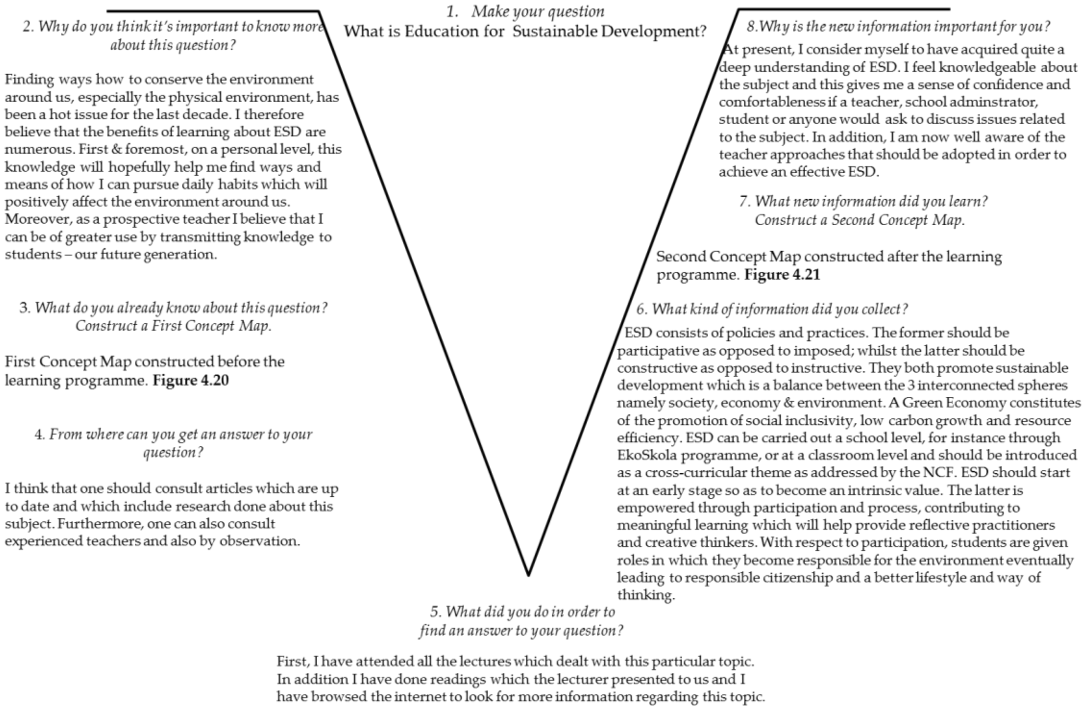

Figure 4.19: Learner 5 Vee Heuristic

The reply given to Question 1 reveals that Learner 5 considered that ESD was related only to the "physical environment". This misconception emerged also in her First Concept Map which reveals her prior knowledge (see Figure 4.20). However, this misconception was corrected at the end of the learning programme as conveyed in the reply given to Question 6 while in her Second Concept Map (see Figure 4.21) this misconception was deleted and replaced by more appropriate concepts and propositions related to what ESD is. It is also worth noting that this learner's language revolves around 'knowledge': "this knowledge will hopefully help me find ways in which I can pursue daily habits which will positively affect the environment around us." It is information, facts and knowledge that are the primary sources of learning for this kind of learner. Even as a teacher, she views "the transmitting of knowledge" as an important factor in her profession. This perspective reflects her Use First in the Sequence and Precise learning patterns.

The answer given to Question 4 shows us that Learner 5 plans to learn by consulting updated articles and research (Precise pattern) and by consulting "experienced teachers and also by observation" (Sequential pattern). Since this learner avoids the Technical Reasoning and the Confluent pattern, she does not prefer to learn through real life experiences or creativity. This sharply contrasts with Learner 2 (see Figure 4.6, p.141) where the language revolved around 'personal experience' rather than 'knowledge'. It also differs from Learner 4 (see Figure 4.15, p. 155) where he stated that, apart from reading books, one can get an answer through different experiences and using creativity. This is a simplistic, yet a clear example of how different learners learn in different ways, and how important this information is for the teachers who are then able to make the material under study relevant to the learner, therefore making their learning meaningful (Johnston, 1998; Novak, 1998).

Learner 5's dominant schema resurfaces in the reply to Question 5 where she stated that she learned through "attending the lectures" and reading what "the lecturer presented". As stated above in the paragraph which described this learner's characteristics, meeting the teacher's expectations is very important for learners with a high score in Sequence. The fact that she also learned by expanding her knowledge through looking up more information reflects her high score in Precision.

The reply given to Question 6 is full of details. One can also observe a coherent sequence and progression of ideas. All the details given in this reply are also represented in the Second Concept Map (see Figure 4.21). This kind of detailed and organised reply is very typical of learners who Use First their Sequential and Precise learning pattern (Johnston, 1998, 2005). In reply to Question 8 one notices that this learner feels good when she acquires a great deal of information and knowledge, and this is revealed in her statement: "I feel knowledgeable about the subject and this gives me a sense of confidence."

From the information given in this Vee Heuristic (see Figure 4.19) one can note a difference between the left and the right hand side. The reply given to Question 2 is very generalist while, on the right hand side, one finds replies which are more coherent, detailed, focused and specific. The answer to Question 2 focuses on knowledge and transmission of knowledge. However, on the right hand side, one finds that this has evolved into not only knowledge, but also to "teachers' different approaches" to teaching and learning as evident in the Vee (see Figure 4.19). This development is also evident in the written reflection.

Learner 5’s assignment and written reflection were very well organised and had a neat presentation. The written reflection was coherent and well documented from both the reading pack I presented and other related literature; all of this further confirms her high score in the Sequence and Precise patterns. Much of what was written reflected my discussion with the students during the lectures. In the LML lexicon this would be interpreted as follows: since this learner avoids taking risks (Confluence) she prefers to stick closely to what the teacher said during the lectures (Sequence) and back it up with relevant literature (Precision). Although this reflection lacks reference to real life experiences, since this learner Avoids the Technical Reasoning pattern, however, the information and whole process as presented during this study unit seem to have triggered off a process of reflection within this learner. This is conveyed by the following words in her written reflection:

> By means of the Learning Connections Inventory I confirmed that I prefer data to be ordered, organised, consistent, detailed and accurate. These learning patterns were reflected in the scoring sheet as I scored highest in the Sequential and Precise processing. This implies that as a teacher I might have the tendency to present information to the students in the same way as I would like, that is detailed and following logical reasoning. However, this would not be catering for students who process information differently. This reflection and awareness encourages me to develop and implement more hands-on activities, problems which can be applied to real life situations and inquiry-based tasks which promote innovation and creativity in my lesson planning.

This was reconfirmed in the following concluding comments of her written reflection:

> Overall this study unit has been an eye-opening experience which encouraged me to reflect about my role with regards to the students’ learning as well as promoting education for sustainable development

If one observes the First Concept Map presented in Figure 4.20 one can see that this learner had very few valid concepts with regards to ESD and this is also confirmed by the spoke and chain structure of this Concept Map (Kinchin et al., 2000). However, if one then observes the Second Concept Map (see Figure 4.21) one will note that all the misconceptions present in the First Concept Map were eliminated while others were altered. One may also note the drastic increase in concepts and propositions revealing that learning has taken place (Novak & Gowin, 1984; Novak, 1998; Cañas et al., 2004, 2006, 2008, 2010, 2012; Afamasaga-Fuata’i, 2009; Correia et al., 2014) and this is corroborated by the net structure of this Concept Map. Referring to the criteria set up for this analysis, one can say that this learner has also experienced a deep approach towards learning.

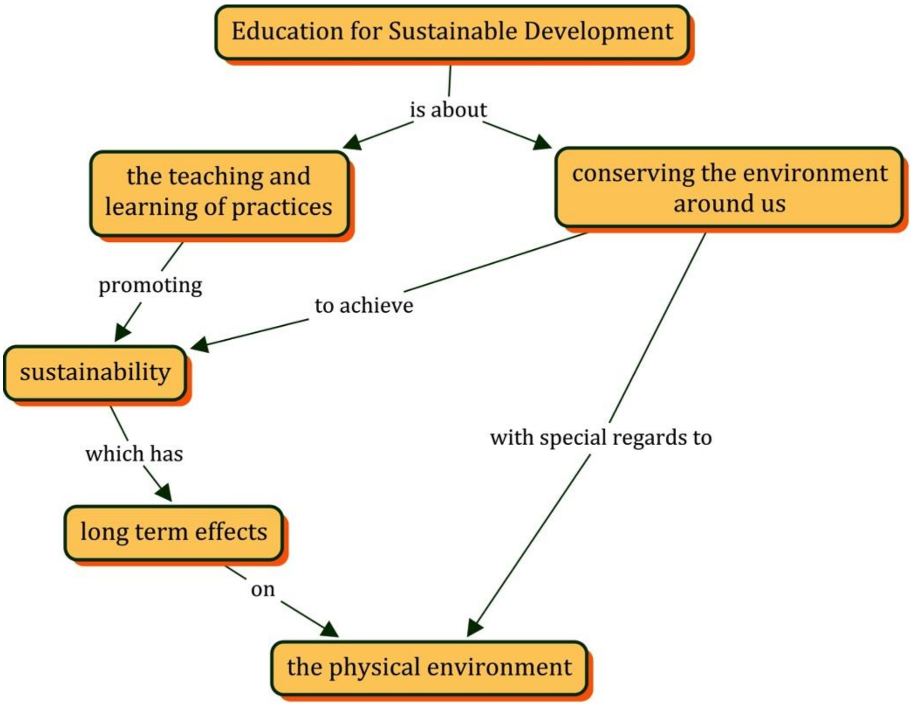

Figure 4.20: First Concept Map constructed by Learner 5 before the learning programme.

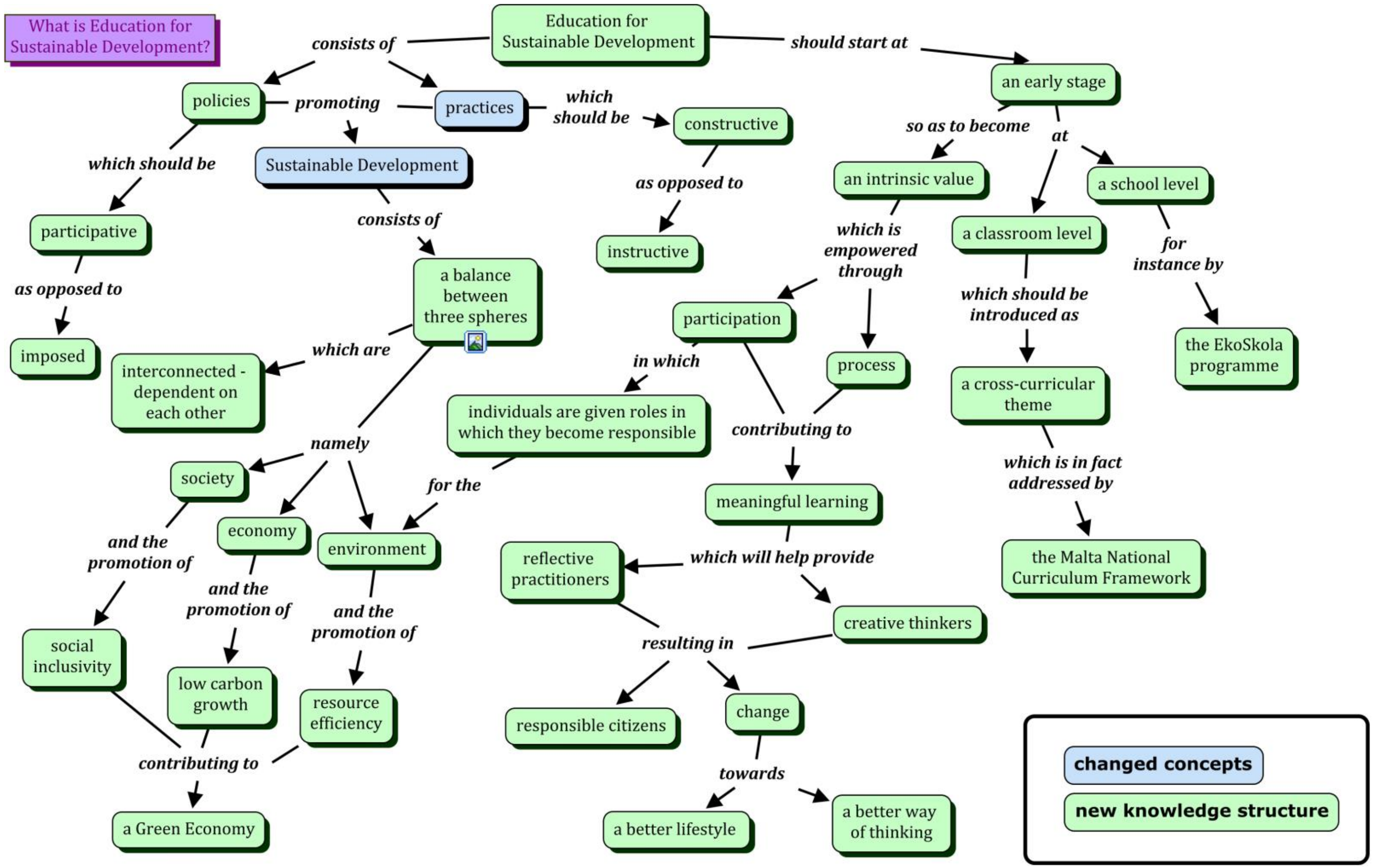

Figure 4.21: Second Concept Map constructed by Learner 5 after the learning programme

4.2 Learner 6

Sequential 22 – Precision 21 – Technical Reasoning 19 – Confluence 14

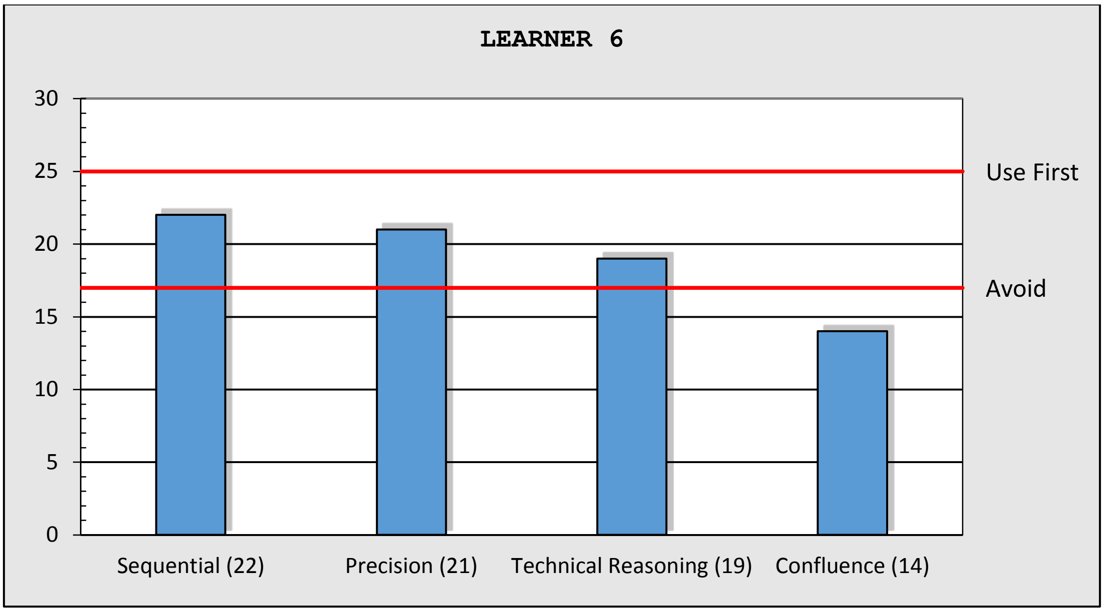

Figure 4.22: Learner 6 LCI scores

This particular learner exhibits a combination of learning patterns which is different from any already presented in this analysis. Learner 6 Uses As Needed the Sequential, Precise and Technical Reasoning pattern whereas she Avoids the Confluent pattern (see Figure 4.22). Therefore, this learner has no learning pattern which scores in the Use First range and consequently, in the LML lexicon one cannot refer to this learner as either ‘dynamic’ or ‘strong-willed’. Since she has three learning patterns within the Use As Needed range and one in the Avoid range, one cannot refer to this learner as a ‘bridge’ learner. This combination of learning patterns which, is not very common, may indicate how diverse our learning patterns can be. However, it is recommended that such LCI scores require the learner to return to the LCI and revisit his/her answers (Johnston, 2010). I did discuss these scores with this learner, but she kept on insisting on the score. Nonetheless, as we shall see in the following analysis, this learner’s preferred way of learning is guided mainly by the learning patterns which have the highest scores in this combination. The highest scores in the Use As Needed range are in the Sequential and Precision patterns consecutively. These are closely followed by the score in the Technical Reasoning pattern. The Confluent pattern has the lowest score and falls within the

Avoid range. This means that this learner prefers to have clear step-by-step directions, and she prefers to see a sample of the work she is required to do since she would like to know exactly what is expected of her. She needs time to plan, to present neat work and to double check her work. She feels comfortable expressing herself in words and prefers thorough explanations since she attends to details. However, there are aspects of the Technical Reasoning pattern which emerge in this learner's preferred way of learning. Being a learner who avoids Confluence, she would rather not make mistakes at all than having to learn from them. Therefore, she is very cautious about answering questions since she does not like to take risks. She does not like to be or feel different from the rest of her peers, and unfamiliar situations cause her anxiety. The Vee Heuristic displayed in Figure 4.23 reveals the process of thinking, feeling and doing that this learner went through.

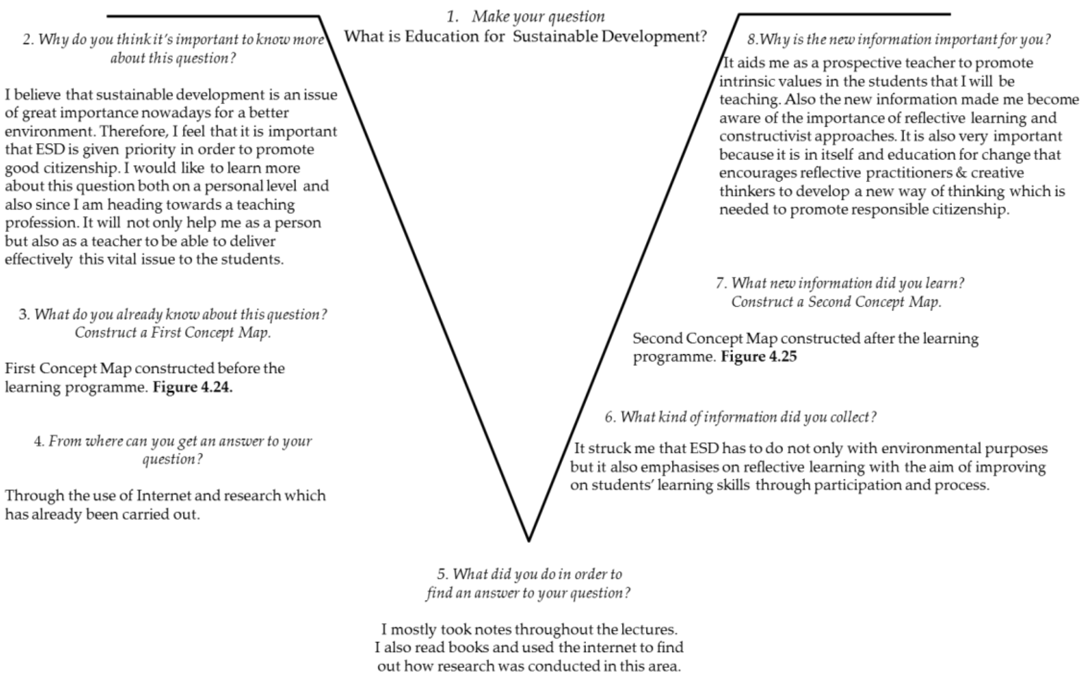

Figure 4.23: Learner 6 Vee Heuristic

If one compares the replies in Learner 6's Vee Heuristic (see Figure 4.23) with Learner 5's Vee Heuristic (see Figure 4.19, p.162) one finds similarities. This may be explained through their learning patterns. If one notes the learning patterns exhibited by Learner 5 in Figure 4.18 (p.161) and the learning patterns exhibited by Learner 6 in Figure 4.22 (p.167), one can see that the learning patterns are resonant. In reality, these two learners study the same subject and I noted that they work a lot together: during the lectures they sat near each other and their assignment was presented in the exactly same format, having even the same front cover. From Figure 4.18 (p.161) and Figure 4.22 (p.167), one can note that the learning patterns of these learners are quite similar and this explains why they felt comfortable working with each other. However, the Concept Maps differed as we can see from Figure 4.24 and Figure 4.25 (Learner 6) and Figure 4.20 and Figure 4.21 (Learner 5). This shows how beneficial Concept Maps are in conveying the different personal structures of knowledge.

The reply to Question 2, which was given in class during the first lecture before the learning programme, is very similar to the reply given by Learner 5 (see Figure 4.19, p. 162). The answer given to this question reveals that this learner wanted to know more about this question because she personally did not know what ESD is all about and, with this knowledge, she would "be able to deliver effectively this vital issue to the students." The LCI scores reveal that this learner leads through Precision and Sequence and this is reflected in the answer given above. The Technical Reason pattern follows closely the high score in Sequence and Precision and aspects of the Technical Reasoning pattern may be traced in the way this learner sees this topic as relevant since she is "heading towards a teaching profession."

It is worth noting that like Learner 5 she had the misconception that ESD is about "a better environment". This misconception is present in her First Concept Map (see Figure 4.24). However, this was corrected on the right hand side of the Vee in reply to Question 6 and was eliminated in the Second Concept Map (see Figure 4.25). In the reply to Question 2 we find a good concept that is, that "ESD promotes good citizenship"; however, this valid concept is not present in the First Concept Map (see Figure 4.24). Yet, we find it present in the second Concept Map (see Figure 4.25). This might suggest that this learner had only a superficial idea that "ESD promotes citizenship" but she did not know deeply enough what the connection is. Nonetheless, after the learning programme, this learner subsumed this concept within her cognitive structure and this is revealed in her Second Concept Map (see Figure 4.25).

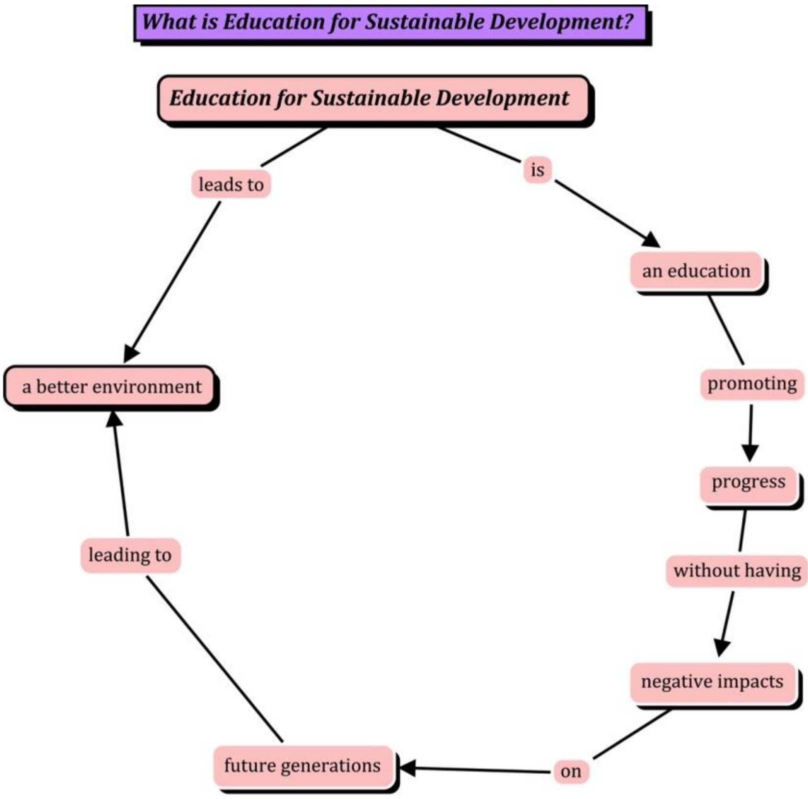

Figure 4.24: First Concept Map constructed by Learner 6 before the learning programme

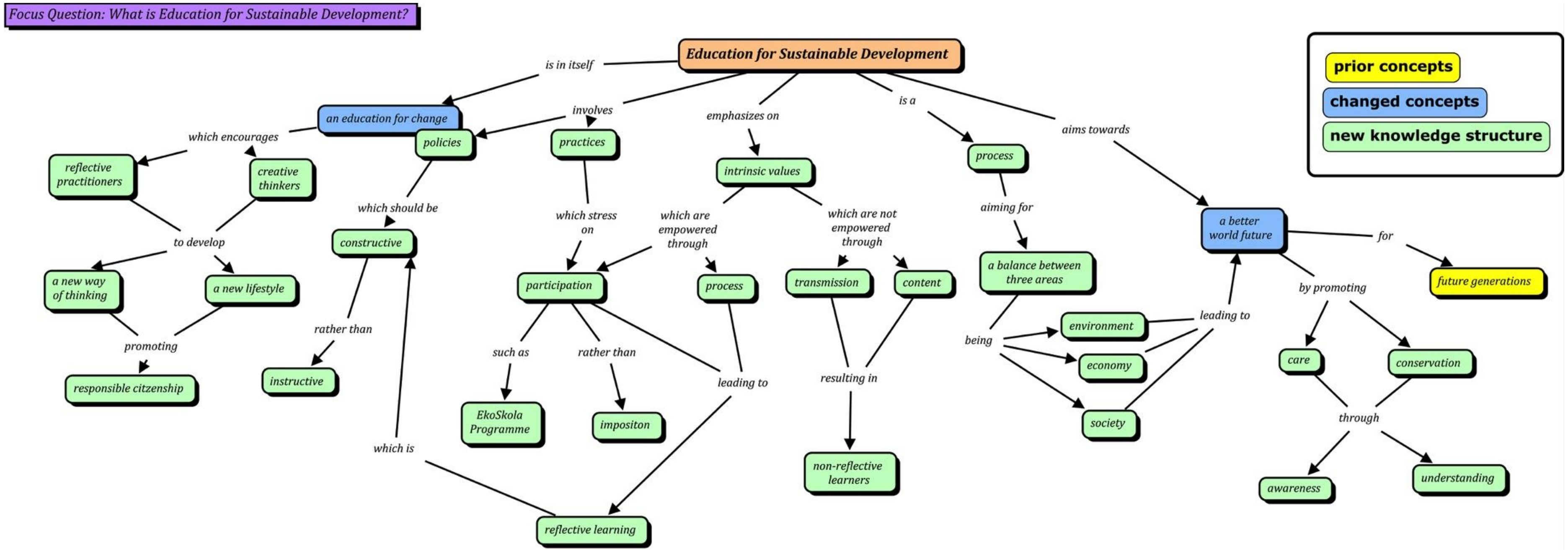

Figure 4.25: Second Concept Map constructed by Learner 6 after the learning programme

The reply to Question 4 shows that this learner intended to learn through research and this reflects only the Precision pattern and could be another reason why her LCI needs to be revisited. Johnston (2010:50) explains that sometimes learners who score high in Precision tend to avoid the answers on the LCI that are on the extremes of the continuum because for these learners "nothing is ever always or never". Therefore, their Precision would be holding them back from selecting a specific answer.

The reply to Question 5 reveals that this learner actually learnt through "notes throughout the lectures" and through reading books and browsing the internet for more information. Here again the Precision pattern is highlighted but aspects of the Sequential pattern are also revealed. The reply given to Question 6 reveals that throughout this learning programme this learner's knowledge about ESD has evolved and this is substantiated in the Second Concept Map constructed after the learning programme (see Figure 4.25).

If one considers the reply given to Question 8 constructed after the learning programme, one would observe that this reply contrasts with the reply given in Question 2 constructed before the learning programme. The former answer is very specific unlike the latter reply which is quite generalist. This indicates that, although this learner exhibited a certain level of interest, her generalist reply suggests a sense of insecurity in the topic under study, which developed into a more positive feeling suggested by the detailed and specific reply given to Question 8.

The assignment and the written reflection by Learner 6 was very well organised and presented. Her written reflection was six pages long and had a very good sequence and progression of ideas. It was backed by relevant literature both from the reading pack and from extra reading. It was very explicit as to how beneficial this learner thought this study unit was; this is reflected in the words below:

> The experience of attending this study unit made me realize that different students learn in different ways and it is in the interest of a good teacher to make sure to cater for them using a variety of approaches. As a student teacher I now perceive an effective teacher, as the one who is aware that there is no right or wrong method of learning and who accepts and respects all students with their unique qualities, even if this means that the teacher has to go out of his/her most comfortable way of teaching.

The written reflection contained good ideas which were backed by relevant and valid literature, but it lacked references to real life experiences. However, the process of reflection and personal growth was evident:

> this study unit made me more aware that in order for educators to be effective, they should move away from traditional transmission approaches, such as teacher exposition which encourage rote learning, and instead focus on more constructive, student-centred methodologies, which encourage metacognition.

She states that she found Concept Mapping “extremely valuable” and she backed this with valid literature. However, she did not state how or if she intends to implement it in her approach. The way that this learning programme was presented yielded deep learning results as evidenced in the written reflection and the following analysis of the Concept Maps.

The First Concept Map (see Figure 4.24) is exhibited as a chain structure revealing limited understanding of the topic (Kinchin, 2001). However, one can observe a development of ideas in the Second Concept Map (see Figure 4.25) which is displayed in a net structure, therefore revealing deeper understanding (Kinchin, 2001). Furthermore, the misconceptions present in the First Concept Map were eliminated while other concepts were altered or added. The increase in concepts and propositions further upholds that learning has taken place (Novak & Gowin, 1984; Novak, 1998; Cañas et al., 2004, 2006, 2008, 2010, 2012; Afamasaga-Fuata’i, 2009; Correia et al., 2014). According to the criteria set for this research, the Second Concept Map evidences a deep approach towards learning.

4.3 Learner 7

Sequential 33 – Precision 32 – Technical Reasoning 26 – Confluence 27

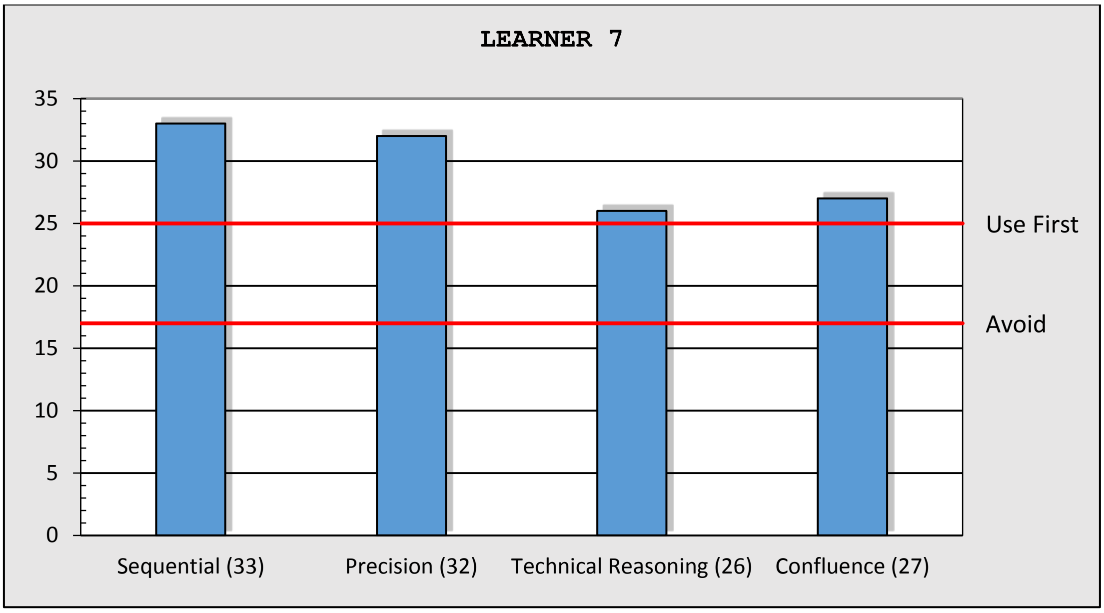

Figure 4.26: LCI scores of Learner 7

The scores of the learning patterns, exhibited above (see Figure 4.26), and as revealed through the LCI, present this learner as a strong-willed learner since she scores high in three or more patterns (Johnston, 2005). The highest score is in the Sequential pattern therefore this would probably be the dominating learning pattern which is closely followed by the Precise, Confluence and Technical Reasoning patterns. Like Learner 4 this learner is also a strong-willed learner; however, the learning patterns of Learner 4 are led by the Technical Reasoning followed by Precision, Confluence and Sequential consecutively (see p.154). We have seen that Learner 4 gives high priority to relevance to life experiences whereas this learner gives priority to organisation and neat work, and she needs to have clear directions. However, due to the fact that even the other learning patterns score high, this learner is also comfortable working with words and details (Precision), with generating new ideas and with being different (Confluence) while also being able to learn from hands-on tasks and real-life experiences (Technical Reasoning). In other words, these kinds of learners have the ability to learn in different ways. What makes them successful is their ability to identify the expectations of the systems and relationships they work, live and play in while using their learning processes with intention to overcome challenges, including understanding and connecting with their instructors, supervisors, colleagues and ourselves (Johnston, 2010).

If we take a look at this learner's Vee Heuristic displayed in Figure 4.27 we can observe a difference between the left and the right hand side of the Vee. The left hand side consists of one short sentence answers while the right hand side has more details.

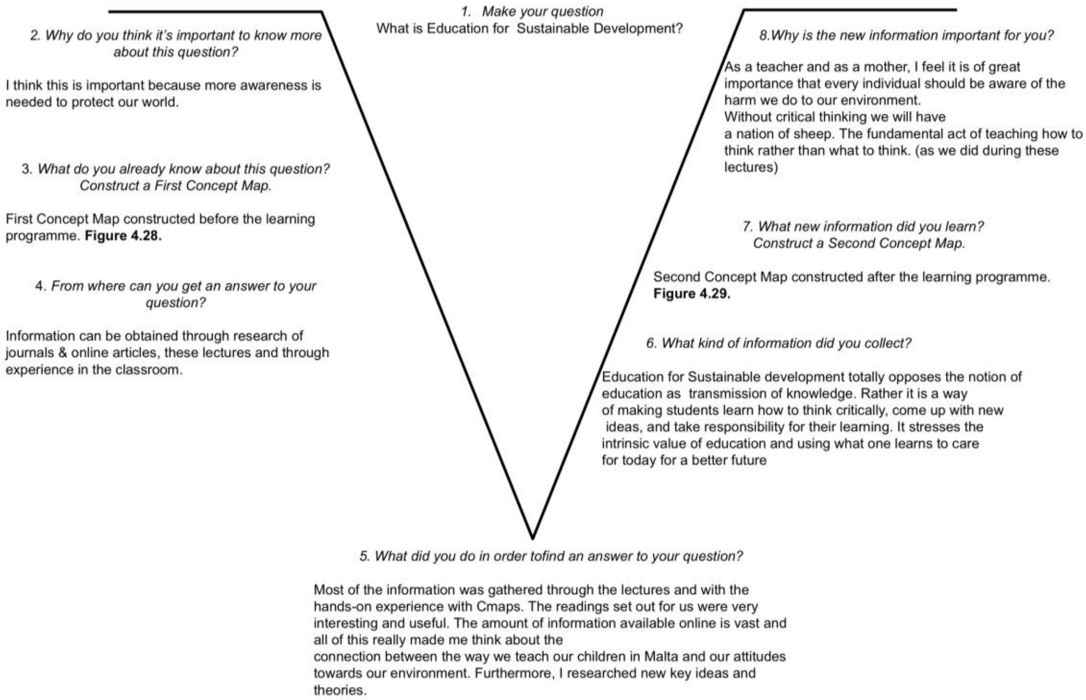

Figure 4.27: Learner 7 Vee Heuristic.

The reply to Question 2 is a very generalist and superficial answer revealing a lack of interest or enthusiasm towards wanting to know more, and this is confirmed through the First Concept Map generated by this learner (see Figure 4.28). This Concept Map does not display any prior knowledge by this learner. Perhaps she was reluctant to display it in a Concept Map or she did not see any value in revealing her prior knowledge. Whatever the reason, it conveys a message of lack of interest and motivation in this study unit.

The reply to Question 4 reflects her high scores in all the patterns since she planned to learn in different ways and this is similar to the reply given by Learner 4. However, the level of interest contrasts with the level of interest demonstrated by Learner 4 who exhibited his curiosity to learn since he saw relevance in this study unit for his future profession.

The replies on the right hand side of the Vee demonstrate an increase in the level of interest since the responses given are all specific, focused and detailed and this is supported in the Second Concept Map represented in Figure 4.29. The details given in the reply to Question 4 regarding how this learner actually learned substantiate her high score in all of the learning patterns since she mentioned the lectures (Sequence), the hands-on experience with CMaps (Technical Reasoning), readings (Precise) and research of new key ideas and theories (Confluence). The reply given to Question 6 suggests that this learner has developed her knowledge not only about ESD but also about the learning process. This is upheld also in the Second Concept Map constructed after the learning programme (see Figure 4.29).

The reply to Question 8 reveals this learner's level of interest at the end of the learning programme and it contrasts strongly with the reply given in Question 2 at the beginning of the learning programme. I would like to draw the reader's attention to the statement "without critical thinking we will have a nation of sheep". Leaving aside the fact that this sentence should have been expressed in a different manner; however, it reveals the high score in Confluence of this learner. Learners who score high in Confluence tend to speak their mind and they do not mind doing it in front of everyone. This is one of the reasons why quite a few of this kind of learners end up in troublesome situations with their teachers. A teacher who is not aware of different learning patterns might view this statement as something 'rude' or 'arrogant' or 'out of place' and so a conflict might be created between the student and the teacher. However, a teacher who is aware of different learning patterns acknowledges the typical characteristics of learners who score high in Confluence, is understanding, and so, better equipped to guide this learner to develop this learning pattern.

This strong-willed learner's learning patterns emerged also in the written reflection. Her assignment was very well organised and presented (Sequence). It was backed by relevant extra literature (Precise), it had various references to real life experiences (Technical Reasoning) and the Confluent pattern emerged in the following different ways:

a. The different way this assignment was presented. Most of the assignments were bound into one whole thing, this assignment was not bound but instead it had the Vees and CMaps stapled together, the written reflection stapled separately and the original LCI inventory on its own. All of these items were neatly presented in a plastic folder.

b. The way that this learner wrote about her thoughts without any inhibitions as the examples below demonstrate

c. Her name and details on the front page were written vertically instead of horizontally like other students. This evidences her drive to present things differently.

The Vee Heuristic (see Figure 4.27) demonstrated that this learner started off this study unit with a lack of interest and the introduction to the written reflection explained that, usually, this learner would choose a subject that did not have anything to do with education per se as an optional study unit, such as swimming or First Aid etc... She did not explain the reason why she ended up doing this study unit but one of the most probable reasons would be a clash in her timetable with the other core subjects. She wrote:

> Usually, the 'optional' study unit was an opportunity for me to delve into a subject that is not my own. I would go for anything that did not have to do with education. This study unit was the exception to my rule and I was shocked at how little I knew about the subject.

Her increase in the level of interest was also reflected in the following words which suggest that the way this study unit was presented may have had a positive effect on her motivation:

> This study unit turned out to be very interesting and beneficial, instead of listening to the usual lecture about learning processes during class. By constructing CMaps and Vee diagrams myself, I could experience benefits by being an active participant in my own learning, being responsible for my own learning, building on my own prior knowledge and learning about the way I process and develop this knowledge.

Her high score in Confluence resurfaces in the following words where, as previously stated, this learner finds it easy to externalise her thoughts:

> The only criticism I have regarding this unit is not a criticism of the unit itself, rather its availability. I have found the information, process and tools so important that I feel that this unit should be compulsory to all future educators. Recent educational policies and documents state the significance of differentiated teaching and the diversity found in our classrooms, but then lectures that give you tools to make use of different processes of learning are only optional.

The conclusion to the written reflection further confirms all of the above and she wrote that for her, this study unit "makes up what Novak & Gowin (1984) call 'true education' that 'changes the meaning of human experience'."

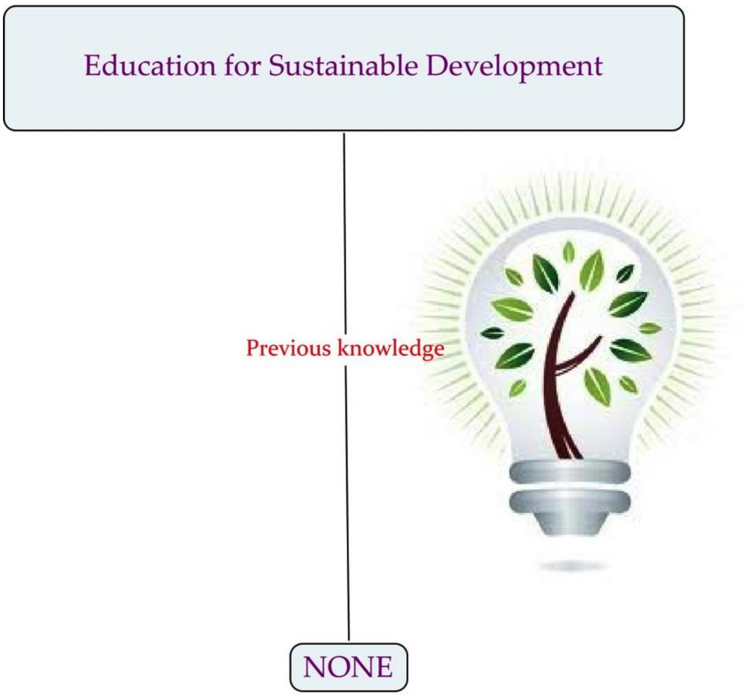

Figure 4.28: First Concept Map constructed by Learner 7 before the learning programme.

The First Concept Map (if this can be referred to as a Concept Map) shown in Figure 4.28 does not demonstrate any kind of prior knowledge. However, if one takes a look at the Second Concept Map (see Figure 4.29) constructed after the learning programme, one can observe a structure of a net of ideas and meaningful propositions indicating that deep understanding has occurred (Kinchin et al., 2000).

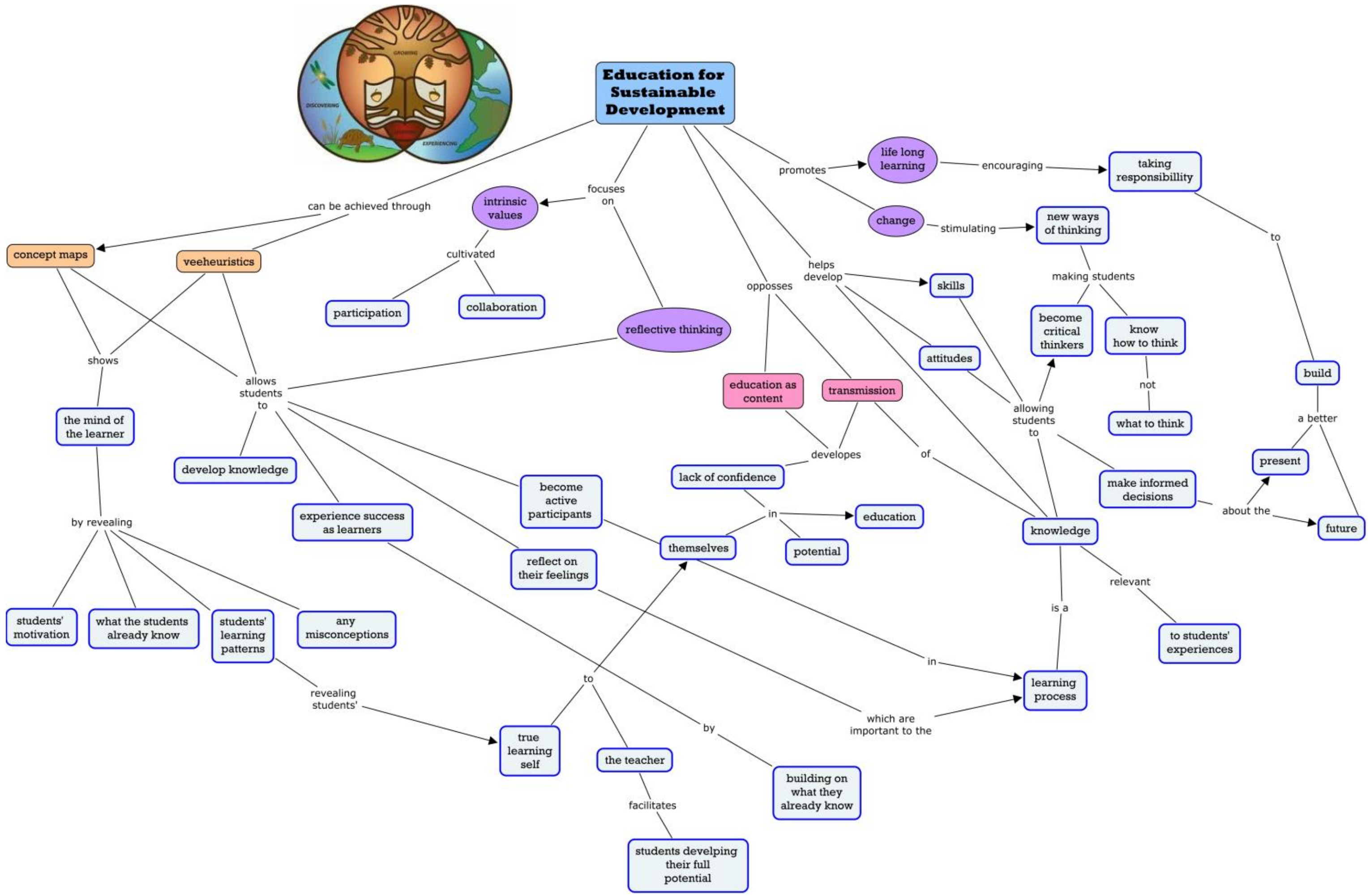

Figure 4.29: Second Concept Map constructed by Learner 7 after the learning programme

CHAPTER 5

FINDINGS AND ANALYSIS – SECOND PHASE

Teachers as Reflective Practitioners to Enhance Meaningful Learning

5.1 Introduction

The research presented in Chapter Four has set out the process and the development of learning through the use of Vee Heuristics and Concept Mapping and the analysis of the data collected during the process which focused on the learner. The second phase of this research developed and delved deeper in order to look at teacher engagement. The aim was to explore teachers' approaches and strategies to teaching and learning within Higher Education. It, therefore, sought to address the secondary exploratory research question which emerged as a result of the first phase research, is presented in Chapter Three and restated below for ease of reference:

> "*How do the tools used get teachers to become reflective practitioners so as to enhance students' meaningful learning?"*

However, this second phase of the research will solely address the lecturers' approaches and strategies to teaching as related to the three mental processes around which this whole study revolves. As noted in Chapters Two and Three, these are cognition (thinking), conation (doing) and affectation (feeling).

In order to attempt to explore teachers' approaches and strategies to teaching and learning, I used semi-structured interviews. To overcome personal bias, the interviewees were selected according to their responses given to an online inventory administered before the interview (see Chapter Three). Therefore, the first step in attempting to get an answer to the secondary research question was to administer a web-based self-completion inventory (see Chapter Three for more detail). Notwithstanding the fact that this online inventory was carried out solely to select, without prejudice, a number of interviewees, the responses provided very interesting results which were worth analyzing and discussing. Since the Approaches to Teaching Inventory (ATI) (Prosser & Trigwell, 1999) is an already validated instrument, as discussed in Chapter Three, I took into consideration only the responses given to the already validated ATI's statements for statistical purposes (see Chapter Three). Through a statistical analysis of the responses of the ATI, I was in a position to discuss whether the lecturers participating in this online inventory tend to go for a deep or a surface approach to teaching and learning. The added statements relating to affectation were not added for statistical purposes, but only to gain more insight into perceptions lecturers hold regarding this mental process so as to be able to formulate questions for the semi-structured interview and to be able to select prospective interviewees according to their responses, therefore, overcoming personal bias in selecting the interviewees. Consequently, the responses given to the added statements related to affectation were not considered for statistical purposes. As discussed in Chapter Three, to be able to take into consideration these statements related to affectation for statistical purposes, one has to reformulate the whole ATI and the statements would have to undergo a rigorous factorial analysis as Prosser and Trigwell (1999) did with the statements in the ATI. This is recommended for future research which would be a whole study on its own but is surely not within the scope of the present study.

5.2 Tests of Statistical Significance

While working on the data deriving from the web-based self-completion inventory I was interested to find out whether my findings could be generalized. In fact, this is the reason why I carried out statistical tests on the already validated ATI's statements (Prosser & Trigwell, 1999) to assess significance. As stated above, the statements related to affectation were excluded from these statistical tests. The section that follows will discuss the statistical significance of the hypotheses.

a) <u>Hypothesis 1</u>

H_0 : The Correlation coefficient measuring the strength of the relationship between the two variables (intention and strategy) is close to 0 indicating no or weak relationship.

H_1 : The Correlation coefficient measuring the strength of the relationship between the two variables (intention and strategy) is significantly different from 0 indicating a strong relationship that is not attributed to chance.

The Pearson correlation coefficient was used to measure the strength of the relationship between intention and strategy (referred to as **Application** in this section) since both variables had a metric scale and a fairly Normal distribution. This test was used to assess this relationship in each of the two subscales, Conceptual Change and Information Transmission, referred to as **Dimensions** in this section. The Pearson Correlation coefficient ranges from -1 to 1, where a large positive correlation coefficient indicates a strong positive relationship, a large negative correlation coefficient indicates a very strong negative relationship and a correlation coefficient close to 0 indicates a weak relationship. A 0.05 level of significance was used to assess statistical significance where H_0 is accepted if the p-value exceeds the 0.05 level of significance and H_1 is accepted if the p-value is less than the 0.05 criterion.

Relationship	Pearson Correlation Coefficient	P-Value
Intention – Strategy Conceptual Change (*deep approach*)	0.376	0.026
Intention – Strategy Information Transmission (*surface approach*)	0.511	0.002

Table 5.1: Table displaying Pearson Correlation Coefficients and p-values

The Pearson Correlation Coefficient (0.376) relating Intention to Strategy for Conceptual Change is positive implying a positive relationship between the two variables. In other words the participants who are scoring high in one variable tend to score high in the other variable. Moreover, this relationship is significant and not attributed to chance, because the P-value (0.026) is less than the 0.05 criterion (see Table 5.1). Therefore, the respondents who score high in intention for both deep and surface approaches also score high in strategy in both deep and surface approaches and vice-versa.

b) <u>Hypothesis 2</u>

H_0 : Mean scores for Intention and Strategy applications are comparable.

H_1 : Mean scores for Intention and Strategy applications differ significantly.

The Two Independent samples t-test was used to compare mean scores for Intention and Strategy in both the Conceptual Change and Information Transmission subscales. This parametric test is appropriate because the Intention and Strategy scores have a metric scale and a fairly Normal distribution. A 0.05 criterion was used to assess statistical significance where H_0 is accepted if the p-value exceeds the 0.05 level of significance and H_1 is accepted if the p-value is less than the 0.05 criterion.

Group Statistics (Conceptual Change)

Application		N	Mean	Std. Deviation	Std. Error Mean
Rating Score	Intention	35	4.21	0.533	0.090
	Strategy	35	3.77	0.637	0.108

$t(68) = 3.155$, p = 0.002

Table 5.2: Mean scores and Standard Deviations for Intention and Strategy within the Conceptual Change dimension.

Group Statistics (Information Transmission)

Application		N	Mean	Std. Deviation	Std. Error Mean
Rating Score	Intention	35	2.93	0.739	0.125
	Strategy	35	2.56	0.601	0.102

$t(68) = 2.262$, $p = 0.027$

Table 5.3: Mean scores and Standard Deviation for Intention and Strategy within the Information Transmission dimension.

In Table 5.2 and Table 5.3 the mean score for Intention always exceeds the mean score for Strategy, implying that the participants are giving more weight to Intention than strategy. Moreover, the p-values displayed in these tables are all less than the 0.05 level of significance implying that differences in mean scores are significant. Hence the results can be generalized to the whole population of lecturers.

c) <u>Hypothesis 3</u>

H_0 : Mean scores for the Conceptual Change and Information Transmission dimensions are comparable.

H_1 : Mean scores for the Conceptual Change and Information Transmission dimensions differ significantly.

The Two Independent samples t-test was again used to compare mean scores for Conceptual Change and Information Transmission subscales in both the Intention and Strategy applications since the scores distributions are fairly Normal. A 0.05 level of significance was employed to assess statistical significance.

Group Statistics (Intention)

Dimension		N	Mean	Std. Deviation	Std. Error Mean
Rating Score	Conceptual change	35	4.21	0.533	0.090
	Information transmission	35	2.93	0.740	0.125

$t(68) = 8.350$, $p < 0.001$

Table 5.4: Mean scores and Standard Deviation for the Conceptual Change and Information Transmission dimension Intention within the Intention application.

Group Statistics (Strategy)

Dimension		N	Mean	Std. Deviation	Std. Error Mean
Rating Score	Conceptual change	35	3.77	0.637	0.108
	Information transmission	35	2.56	0.601	0.102

$t(68) = 8.153$, $p < 0.001$

Table 5.5: Mean scores and Standard Deviation for the Conceptual Change and Information Transmission dimension Intention within the Strategy application.

In Table 5.4 and Table 5.5 the mean score for Conceptual Change always exceeds the mean score for Information Transmission, implying that the participants are giving more weight to Conceptual Change than Information Transmission. Moreover, the p-values displayed in these tables are all less than the 0.05 level of significance implying that differences in mean scores are significant and not attributed to chance. Hence, the results can be generalized to the whole population of lecturers. Therefore, the trend is that the lecturers are going more for a deep approach than for a surface approach of learning.

d) <u>Hypothesis 4</u>

H_0 : There is no interaction effect between Dimensions and Application

H_1 : There is significant interaction effect between Dimensions and Application.

The Two-Way ANOVA test was used to examine the interaction effect between the Dimension and Application and assess the effect of the Conceptual Change and Information Transmission dimensions on the differences between the rating scores for Intention and Strategy.

Tests of Between-Subjects Effects

Source	Sum of Squares	Df	Mean Square	F	P-value
Corrected Model	60.130[a]	3	20.043	50.197	0.000
Intercept	1589.629	1	1589.629	3981.129	0.000
Application	5.700	1	5.700	14.276	0.000
Dimension	54.375	1	54.375	136.180	0.000
Application * Dimension	.054	1	0.054	0.135	0.714
Error	54.304	136	0.399		
Total	1704.063	140			
Corrected Total	114.433	139			

R Squared = 0.525

Table 5.6: Results of the Two-Way ANOVA test

The p-value (0.714) for the interaction term Dimensions (Conceptual Change and Information Transmission) x Application (Intention & Strategy) exceeds the 0.05 criterion implying that the interaction effect is marginal and not significant (see Table 5.6). This is clearly displayed in the line graph below (see Figure 5.1) where the two lines are almost parallel. In other words, the differences between the mean scores for Intention and Strategy are comparable for the Conceptual Change and Information Transmission dimensions. The R-square value measures goodness of fit. An R-square value (0.525) indicates that this 2-predictor model with interaction explains 52.5% of the total variance in the responses (rating scores). This implies that there are other predictors (not included in this study) that explain the remaining 47.5% of the total variance.

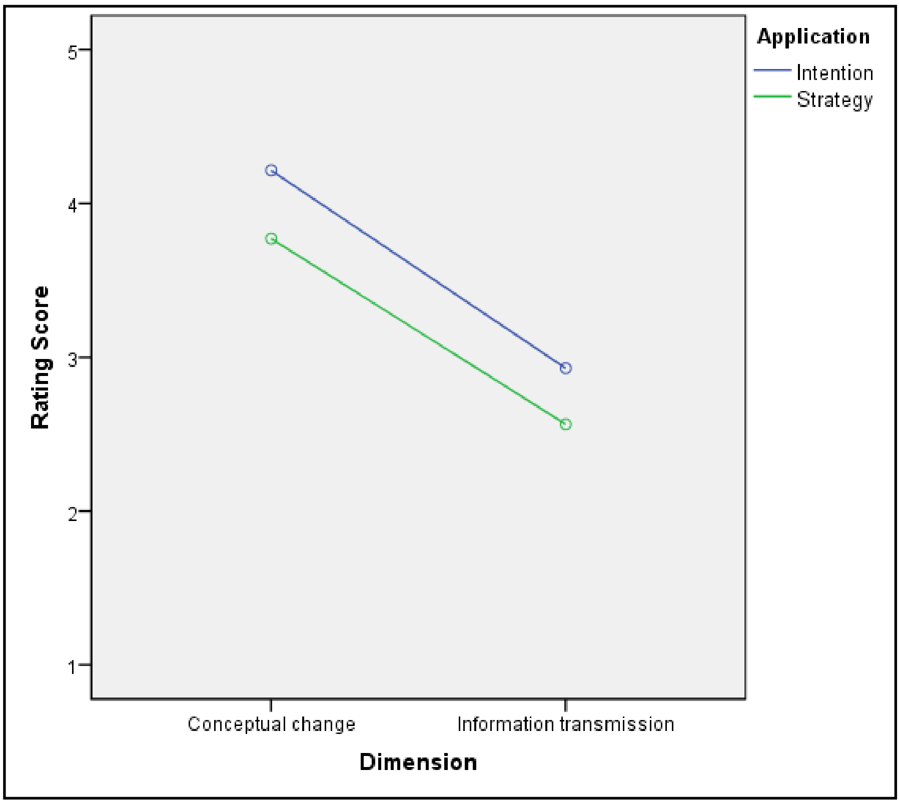

Figure 5.1: Line Graph displaying mean rating scores for Application (intention & strategy) categorized by Dimension (Conceptual Change & Information Transmission)

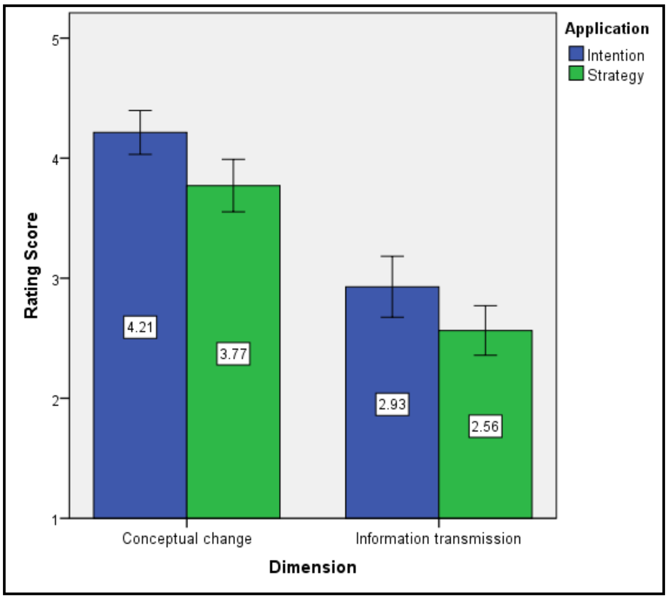

Figure 5.2: Error Bar Graph displaying 95% confidence intervals for mean rating scores for different combinations of Application and Dimension categories

Figure 5.2 displays the 95% confidence intervals which provide a range of values for the actual mean rating scores provided for a particular dimension or application if the whole population of lecturers had to be included in the study. For instance, we are 95% confident that the actual mean score for Intention within the Conceptual Change dimension lies between 4.0 and 4.4. Alternatively, error bar graphs can display +/-1 standard errors from the mean rating scores, which, however, guarantee solely a 68% degree of confidence. In fact, the error bars displayed in Figure 5.3 are smaller in size than those displayed in Figure 5.2.

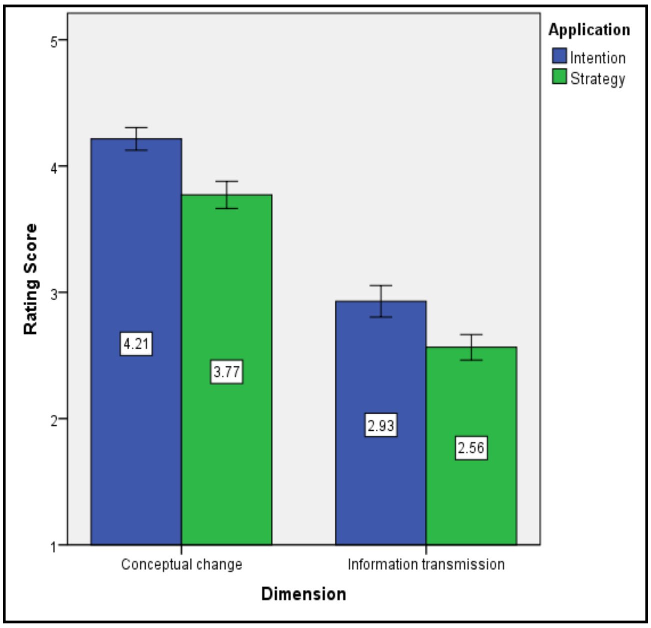

Figure 5.3: Error Bar Graph displaying +/-1 standard error from mean rating scores for different combinations of Application and Dimension categories

5.3 Analysis of data collected through the online inventory.

The statistical analysis presented above reveals and corroborates the research carried out by Prosser and Trigwell (1992:471) “the results of the analysis of the questionnaire are consistent with the congruence of the relationship between intention and strategy. It shows that the strategy adopted by these teachers matches the intention they have for their teaching.” Moreover, from the data collected through the online inventory, it also appears that teachers’ commitment to Intention is much greater than commitment to Strategy. The above tests carried out with this quantitative data also indicate that teachers know more about conceptual change and information transmission than they actually put into effect strategically. Therefore, teachers need to become aware of a variation of strategies to use in the classroom; however, this on its own will not suffice to change approaches to teaching (Prosser & Trigwell, 1999). Teachers need also to understand why they are using a particular strategy. This means that they also need to go through a process where they reflect on their own practice and pursue professional development to gain a better understanding of how learning theories are continuously evolving so that they will be able to integrate theory with practice.

The results also revealed that the majority of lecturers who participated through the online inventory tend to make use of a deep approach towards teaching. However, the results revealed that lecturers tend to focus more on intention than on strategy. This shows that, although lecturers aim for a deep approach towards learning, their strategies do not tend to be varied to respond to different learners who approach learning in different ways. It may also imply that the lecturers have an incomplete or poor understanding of what deep learning actually is and what kind of learning processes are associated with it. This online inventory served as a precursor to the semi-structured interview and it guided me to construct a semi-structured interview schedule (see Appendix F) to be used during the interview and which would help me in answering the secondary research question.

5.4 Analysis of data collected during interviews.

The Concept Maps developed from the data collected through interviews (see Chapter Three) and which are presented in Figure 5.4, Figure 5.5, Figure 5.6, Figure 5.7, Figure 5.8 and Figure 5.9 facilitated the process of my analyses of qualitative data. The themes (categories) emerging from the semi-structured interviews are clearly depicted in the concept maps and this helped me to organize my analysis, comparison and eventually the discussion that follows.

5.5 Concept Maps

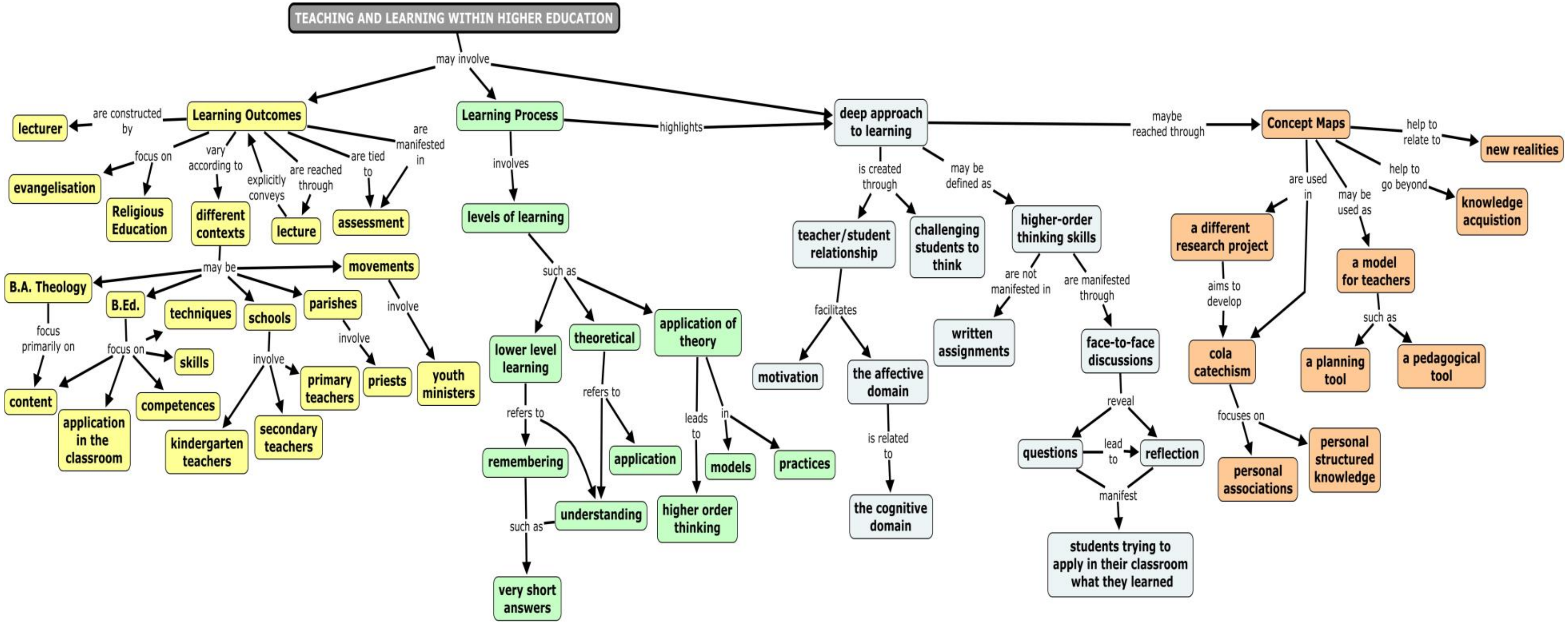

Figure 5.4: Concept Map of Interview with Participant 2

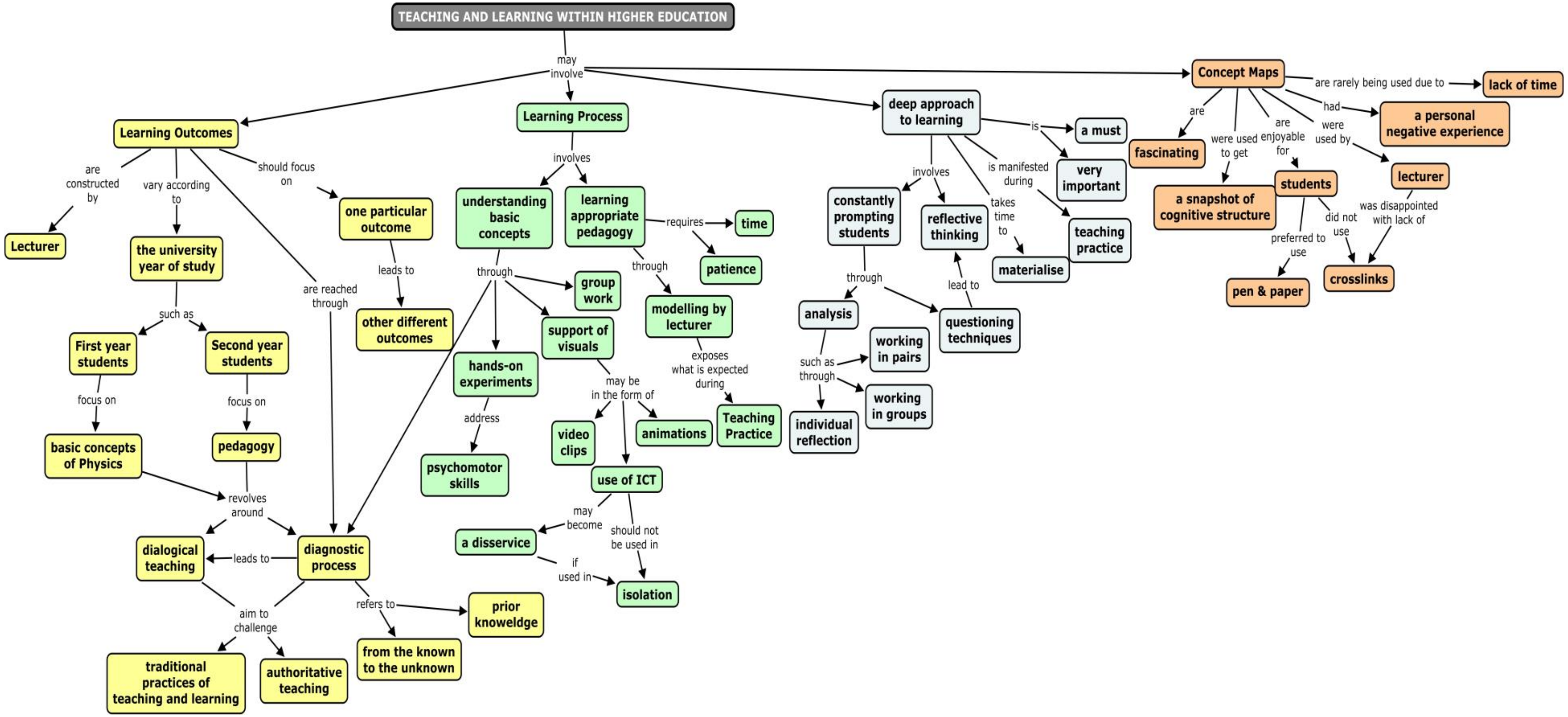

Figure 5.5: Concept Map of Interview with Participant 3

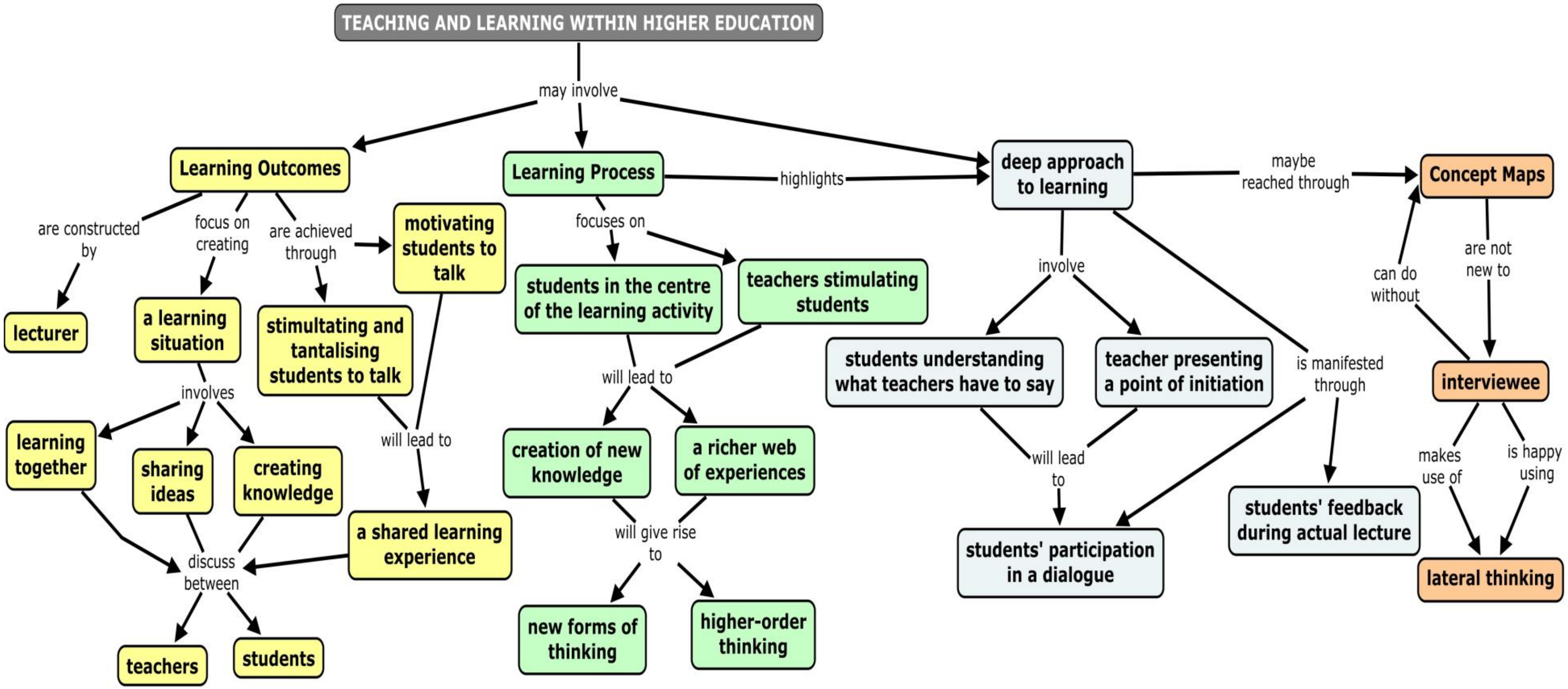

Figure 5.6: Concept Map of Interview with Participant 4

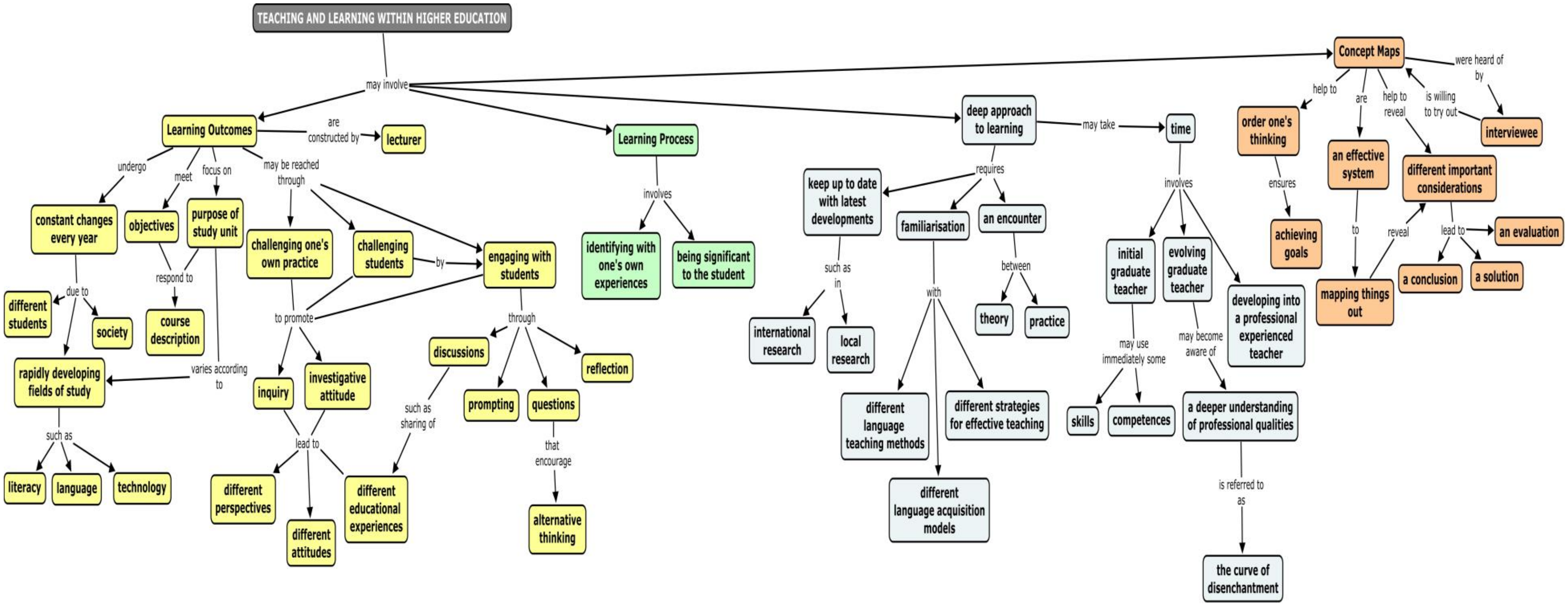

Figure 5.7: Concept Map of Interview with Participant 8

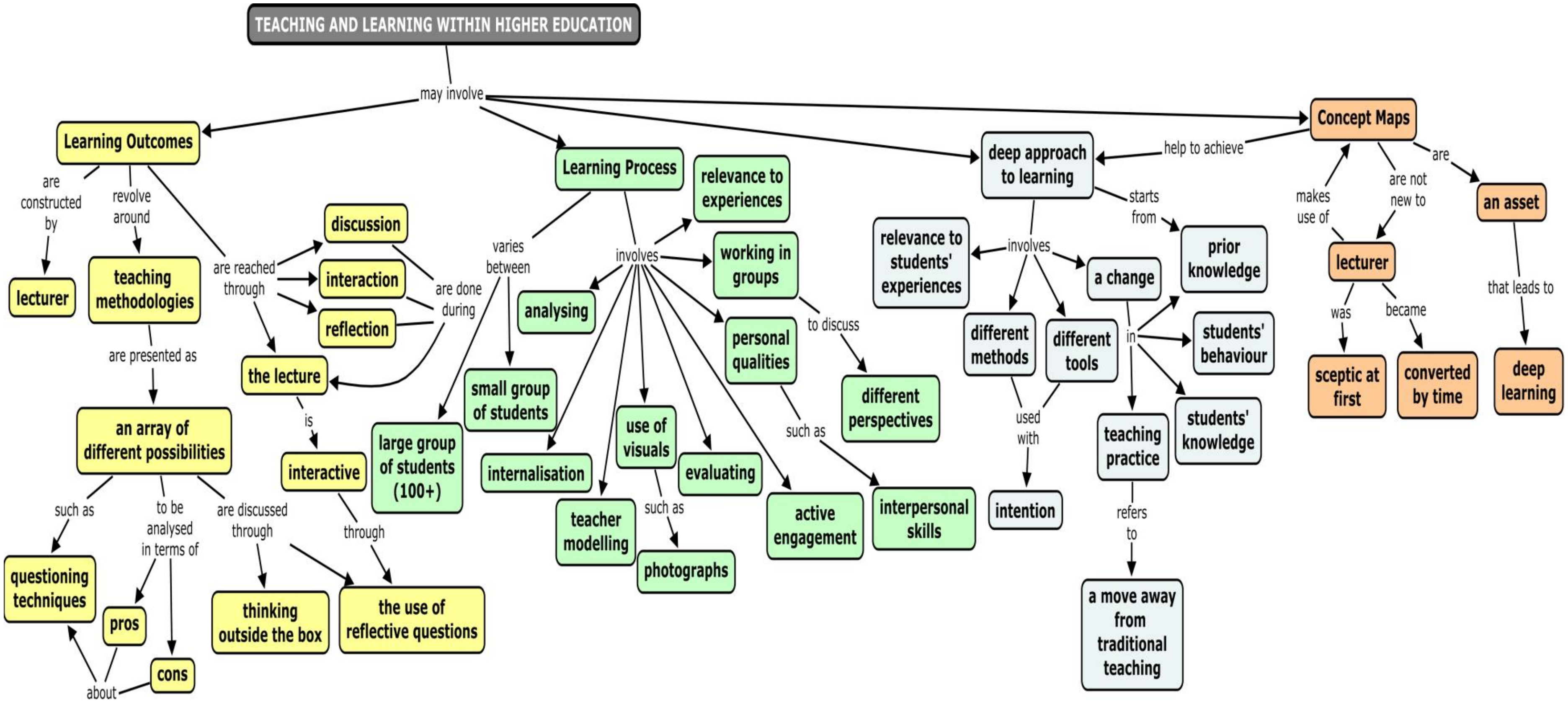

Figure 5.8: Concept Map of Interview with Participant 9

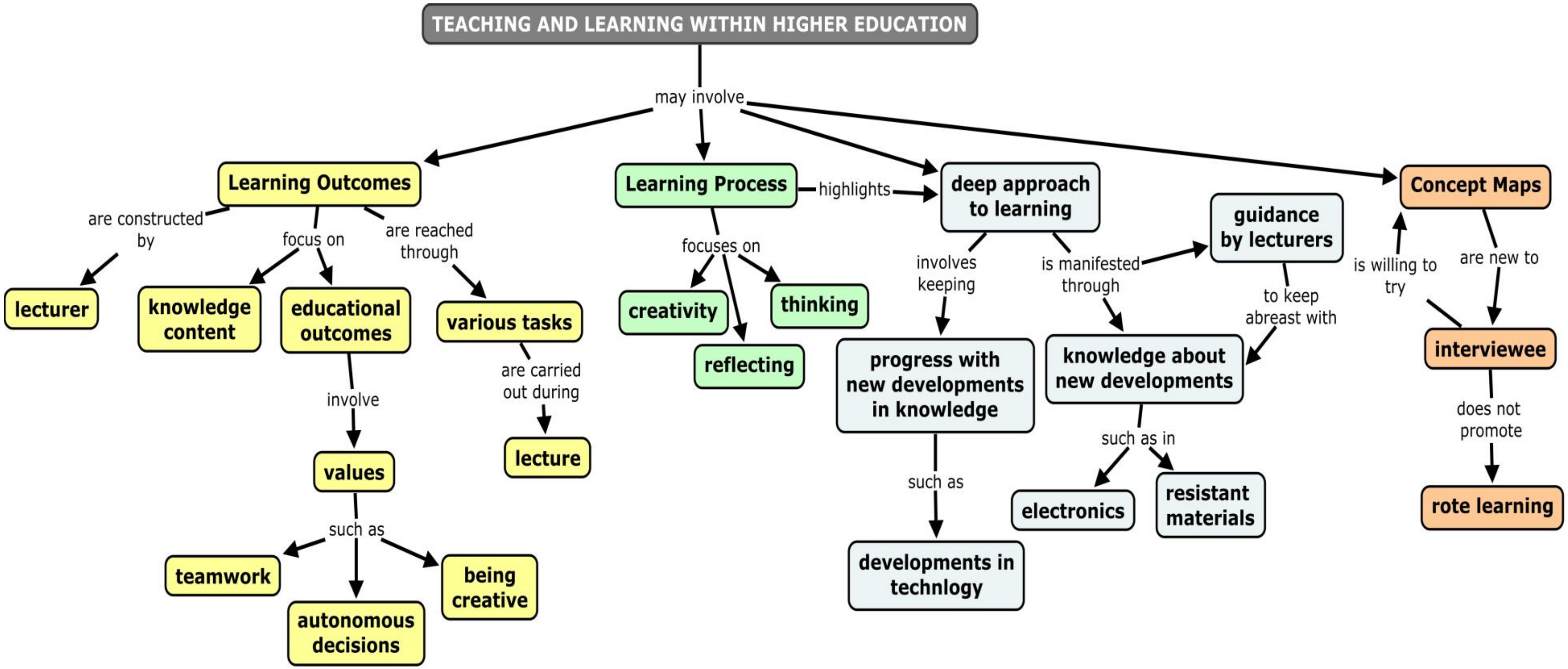

Figure 5.9: Concept Map of Interview with Participant 11

5.6 Learning Outcomes

The participants' concepts about learning outcomes presented in the Concept Maps (see Figure 5.4, Figure 5.5, Figure 5.6, Figure 5.7, Figure 5.8 and Figure 5.9), reveal that among these participants the notion of learning outcomes is still impinged by the traditional view. First and foremost, the idea of learning outcomes being an iterative process involving both teachers and students seems to be beyond these participants' perception. All of them confidently stated that the learning outcomes are constructed by themselves. Furthermore, when one observes the concept maps, one can easily realise that these participants have a fragmented notion of what a learning outcome should be. The majority of them expressed concepts relating to learning outcomes in terms of the content being taught. Only Participant 11 mentioned "values" such as "teamwork", "autonomous decisions" or "being creative" in relation to learning outcomes. Participant 4 mentioned "motivation" not because he regards this as an outcome in itself but to motivate the students "to talk". Therefore the learning outcomes intended by these lecturers mainly focus on knowledge and/or content.

On a positive and encouraging note, many participants tend to reach their learning outcome(s) through "interacting" and "engaging with students" such as through "reflective questions", "discussion", "dialogical teaching", and "learning together". However, these techniques are not presented as means of responding to different learners but because they seem embedded in how these lecturers teach. They are not used with the intention to revolve around the learner. They seem to relate more to the management of teaching. Their approach is an automated process rather than being intended or explicit (McAlpine et al., 1999).

It is very clear that these participants tend to have an incomplete understanding of the term 'learning outcome' as proposed in the literature (Chapter Two, p.75-78) Therefore, although they seem to be lecturers who are able to think on their feet (reflection-in-action), no one made reference to 'emergent outcomes'. Although this might be taking place, none of the lecturers referred to it, implying that these teachable moments are being overlooked. It is interesting to note that, Participant 4 was close to this argument, but he was not able to express it explicitly. Therefore, although he might be doing reflection-in-action he seems to be doing it unconsciously, because that is his way of teaching and not because he links it to successful or meaningful learning or because he is aware that in this way he is encouraging deep learning (McAlpine et al., 1999).

Nevertheless, although their concept of learning outcomes might not be clear or technically correct, their approach to achieving them promotes deep learning according to the literature presented in Chapter Two, and this reinforces the results collected in the online inventories.

5.7 The Learning Process

This research is founded on the premise that learning is a complex process involving cognition (thinking), conation (doing) and affectation (feeling) (see Chapter Two). Furthermore, following Novak's meaningful learning theory, one has to at least take into consideration each of these mental processes for meaningful learning to take place. According to Novak and Gowin (1984), based on Ausubel's assimilation theory, prior knowledge is also a critical contributing factor affecting learning.

From the concept maps presented in Figure 5.4, Figure 5.5, Figure 5.6, Figure 5.7, Figure 5.8 and Figure 5.9, it is evident that all the participants have either limited or fragmented information in connection with how learning occurs. For example, Participant 4 mentions only the cognitive aspect revealing that he gives more importance to the "creation of new knowledge…that will hopefully…give rise to new forms of thinking, to higher order thinking." Similarly Participant 11, who seems to have the most limited view of learning, mentions only "creativity", "thinking" and "reflecting" in connection with the learning process: "Creativity is one of the most important issues. Creativity and the other issue is ... reflecting? Thinking, you know, they have to reflect and think about what they are doing alright? All the time."

On the other hand, Participant 9 and Participant 3 focus mainly on the conation aspect and mention various skills and strategies such as "group work", "hands-on experiments", "use of visuals", "analysing", "questioning", "teacher modelling", etc… Participant 9 mentions also "relevance to experiences" while for Participant 8 this seems to be the only important factor in the learning process: "That they identify with what is being done in the lecture room, they can identify, bring their own experiences, bring their own thoughts and views, they see the relevance of what is happening to their own needs as intended teachers but especially to their own individual needs as intended teachers, as persons who are developing at university level."

Participant 2 focuses on cognition, but he explains the learning process in terms of Bloom's Taxonomy levels of learning (Bloom, 1984). Although he describes this taxonomy in correct detail when asked about the learning process, he fails to link it with the learning outcomes. Only Participant 9 referred to affective factors, for example: “so your image of a teacher, a good teacher, which is usually referring to the way he treated you as a person, the way he interacted with you as a person, not as a teacher teaching a subject, OK? …whether he joked or she joked or whether she was around when you had problems…you know, that sort of thing.” Yet, this participant mentions this aspect quite superficially, without going in detail or deep into this aspect and without linking it or mentioning it as a contributing factor to meaningful learning.

None of the participants mentioned affective factors such as ‘self-esteem’, ‘motivation’ or ‘engagement’. The lecturers, probably, all know about the importance of these mental factors, yet they failed to mention them. This implies that these factors are not considered crucial for learning to take place or they are overlooked. This is consistent with the literature presented in Chapter Two that shows that many times affective factors are neglected. The fact that affective factors are disregarded as crucial factors in the learning process relates and/or is linked to the fact that affective factors are also missing in the learning outcomes.

Only two participants mentioned the importance of prior knowledge in the data collected through the interviews. For example Participant 9 stated “If you want to get really deep learning, what you should start is something like: …Let me see what you know about it.” On the other hand, Participant 3 mentioned prior knowledge and related it to learning outcomes: “In order to arrive at this learning outcome…I start off with what the students know.” This leads one to conclude that a number of lecturers tend to disregard the importance of prior knowledge.

The data collected through the semi-structured interviews in connection with the learning process is quite alarming. If these lecturers are disregarding affective factors how can one expect the prospective teachers, who are students being lectured by these lecturers, to be challenged to be transformative agents of teaching and learning? I think that this lack of deep knowledge about the learning process is regurgitating the status quo in our educational system. Interestingly enough, a few of the participants mentioned this issue during the interview. For example Participant 3 when talking about “uprooting old and quite irrelevant habits” also stated that “normally those who embrace it are very few. If you have a group of 15 you would have 3 or 2 students who have embraced it.” Similarly, Participant 9 stated “…our teaching practice, where basically it is a crucible where all the skills and stuff that they learned from us are actually put into practice. Now, the vast majority, you actually go there and see very traditional teaching, ok, spiced with the latest technologies and latest gadgetry and the latest video clips and whatever…but still, there's no student active engagement."

From the data analysed above, I can confirm that, considering the techniques used by the lecturers, they might have the intention to go for a deep learning approach; however, this is done in an automated process without any serious intention or without any clear knowledge of meaningful learning. This reinforces my perception put forward in my research that teachers must be engaged deeply both in the subject and the learning process for meaningful learning to take place. Furthermore, it demonstrates the lack of understanding of one basic question underlying teaching: "how does learning occur?" This is also substantiated in the following paragraphs.

5.8 Deep Approach

Deep learning involves students engaging with the subject they are studying in a way that comprehension is promoted through critical and reflective analysis of new knowledge which is linked to prior knowledge and experiences leading to long term retention and effective application in future contexts (refer to Chapter Two). Entwistle and Ramsden (1983) and Biggs (1987) state that there is a positive correlation between deep approaches to learning and academic performance.

Furthermore, Millar et al. (1989) and Prosser and Trigwell (1999) point out that students with a deep approach to learning expose a greater degree of conceptual change. This is supported by Marton and Booth (1997:158) who state that "…learning in the sense of changing one's way of experiencing a phenomenon is contingent on one's approach to learning." The conceptions of both teaching and learning held by teachers affect their approaches to teaching (Prosser & Trigwell, 1999).

The concept maps presented in Figure 5.4, Figure 5.5, Figure 5.6, Figure 5.7, Figure 5.8 and Figure 5.9 demonstrate that the majority of these participants have an incomplete understanding of what deep learning is. For example, Participant 11's concept map showed that this lecturer was not aware of what deep learning is since he said "deep approach is usually manifested, you know, by knowing exactly ehm…the new developments in such areas for example such as electronics, alright?" while Participant 8 stated "I am not sure what you mean by deep approach …are we saying it's more intellectual?"

On the other hand, Participant 2 stated "once you establish a relationship then you can work more on the affective level, once there is motivation and the affective domain is taken care of, then it is easier to speak and to relate to the cognitive domain, starting obviously from basic understanding but trying to go deeper and deeper and challenging students to think." This was quite an interesting statement; however, it shows confusion in concepts. This lecturer mentioned the affective factors as important factors towards deep learning but he then confused them with the levels of learning in Bloom's taxonomy. Therefore, this lecturer has valid concepts which are not being placed in their correct perspective. Participant 9 was the only lecturer who linked deep learning to change: "if I am successful in deep learning, then I can see changes in the student."

Notwithstanding the fact that most of these lecturers had an incomplete understanding or misconceptions about deep learning, they all had one thing in common: they all talked about the importance of interaction and they all gave very valid examples of how they promote interaction in their classrooms. For example, Participant 4 stated "…usually after the first half an hour or so, I start getting feedback from their side which means that they are assimilating what I'm saying, they're processing what I'm saying and they are giving back their continued dialogue which I try to instill between us."

As the analysis in the previous paragraphs showed, the approaches used by these lecturers all foster a deep approach towards learning with the main intention of having the students think outside the box and making them reflect critically on the topic under discussion. However, there are a number of incomplete conceptions even with regards to deep learning. Ironically, one of the lecturers stated: "If you are using drama, just for the sake of using drama, you might as well forget it…but if you are using drama to get your students to think and act and behave in such a way that they are sort of externalizing their ideas that is a different issue. So what I mean by…I have my questions about whether we are achieving deep learning or not, this is what I mean." This participant is questioning the fact that, from the online inventory, it transpired that the lecturers are going for a deep approach towards teaching and learning.

This analysis is indicating that the intention of these lecturers is a good intention, that is to say, to make the students learn how to analyse, reflect and evaluate, understand and apply, and that the strategies they are using seem to match this intention. This corroborates the findings of the online inventory and reinforces the quantitative data depicted in Table 5.4 and Table 5.5 that most of the lecturers go for a deep approach to learning. However, it also explains why they tend to score high in Intention rather than Strategy (see Table 5.2 and Table 5.3). Although the strategies they use respond to a deep approach as revealed in their responses during the semi-structured interviews and substantiated in the statistical analysis (see Table 5.1), this is done without intention. As a result, this indicates that lecturers are focusing more on the content rather than the process of learning. The incomplete understanding of conceptions pertaining to learning outcomes, the learning process, deep and meaningful learning which was exposed during the semi-structured interviews implies that this is being done through an automated process and not with a clear and explicit intention to bring about change. This might be the reason why students are ending up teaching in the prevailing traditional method as declared by a few of the participants. For example, Participant 9 stated that "and even after we discuss, certain students still produce traditional lessons." This might imply that students do not have, and/or are not equipped with any innovative practices and do not have a complete and adequate comprehension of complex concepts of teaching and learning. This is mirrored in Entwistle and Walker (2000) when they call for faculty members' development that would support lecturers to develop more sophisticated conceptions of teaching and learning. Similarly, Prosser and Trigwell (1999) argue that this suggests, as a result, that "just helping staff become aware of, or even practicing, particular strategies will not lead to substantial changes in teaching practices…..improvements of teaching may be conceived of as requiring a conceptual change on the part of the teachers concerned" (Prosser & Trigwell, 1999:471-472). With process- and theory- focused intentions rather than only method driven ones, the implications of meaningful learning become innumerable (Novak, 1998). This leads us to the use of Concept Maps.

5.9 Concept Mapping

This research has used Concept Maps in two different ways, namely, as a pedagogical tool and as a research tool. The questions posed during the interviews revolved around the use of Concept Maps as an innovative pedagogical tool.

Chapter Two in this research presented in detail the prevalent literature pertaining to the use of Concept Maps as being metacognitive tools that are grounded in Novak's meaningful learning theory. Furthermore, they are based upon constructivist epistemology and build on prior knowledge and experiences.

Vanhear (2012, 2013) and Vanhear & Reid (2014) reveal the use of Concept Maps as not being limited to cognition but involving other important underlying mental processes, such as conation and affectation. Consequently, Concept Mapping is a robust tool which responds effectively to the learner variability present in today's classrooms to yield meaningful learning.

The analysis of the Concept Maps presented in Figure 5.4, Figure 5.5, Figure 5.6, Figure 5.7, Figure 5.8 and Figure 5.9 revealed that all the participants, except for one, were willing to use Concept Maps in their classrooms. Three of the participants stated that they were familiar with the use of Concept Mapping. Participant 11 had never heard of Concept Maps while Participant 8 stated that he knew about Concept Maps: "it is one effective system of ensuring that if you are dealing with an issue, you're dealing with a problem, you're mapping things out in a way to consider all the different options, all the different considerations…to arrive at a solution." I subsequently realized that Participant 8 was confusing Concept Maps with Mind Maps.

Participant 4, on the other hand, specified that he knew about Concept Maps but that "at the moment" he is "getting along well with lateral thinking" and therefore he does not feel the need to use Concept Maps. Participant 2 was quite familiar with Concept Mapping but he was not using them in the classroom, he was using them "in a different research project". However, he was willing to make use of Concept Maps in the classroom "as a model for teachers…for their own planning" and to "use Concept Maps in their Religious education lesson and be able to explore Religious concepts through Concept Maps."

Participant 3 finds Concept Maps "fascinating" and he used to make use of Concept Maps in his classroom "to get a snap shot of their cognitive structure vis-à-vis a topic in Physics". However, he stopped using them owing to the fact that "the course has a limited amount of time so the amount of thinking they do was limited but also because I think it is not a normal cognitive process…I think that cross linking is not a normal process." During the interview, this participant explained in detail that, while working on his PhD, he had a negative experience with the use of Concept Maps and so he said "OK, this is not my way, I have to go somewhere else." The sharing of experiences with this participant revealed how his PhD tutor made use of Concept Maps, compelling the participant to use them too. This indicates that when something is imposed, without appropriate support, it might be counterproductive.

Participant 9 indicated that, when he was introduced to Concept Maps, he thought that they were “another gimmick”, but he later came to understand that Concept Maps are “an asset that helps both the learner and the teacher achieve deep learning.” He added that it also depends on the “attitude it’s being used with” implying that, although he nowadays values the use of Concept Maps, if the teacher is not interested in them, she/he might “use them badly or project misconceptions on that tool.” This participant along with Participants 3 and 4 reinforced my perception presented in my research that if a teacher does not see value in the tool, he/she will find neither the time nor the effort to invest in the tool no matter how innovative and effective it might seem.

Although these three participants were familiar with Concept Maps, their perception was limited to the use of Concept Maps as a cognitive tool. This incomplete understanding, yet again, is putting them at a disadvantage and is limiting the potential of the use of Concept Maps. Concept maps are presented in this research as a way of facilitating meaningful learning and they are founded on a theory of learning that takes into consideration thinking, feeling and doing (Novak & Gowin, 1984). However, many of the interviewees either did not know about Concept Maps or did not see the benefits in their use.

CHAPTER 6

CONCLUSIONS

This chapter examines the extent to which the research gaps and problems identified in chapter One have been addressed. It highlights some of the potential contributions and implications of the findings of the study to teaching and learning and proposes recommendations to improve the effectiveness of teaching and learning in higher education.

The principal aim of this study was “to introduce the use of Vee Heuristics and Concept Mapping within Higher Education in Malta” (see p.7). Through this research these two metacognitive tools, which are completely innovative to the Maltese educational system, were introduced with students in Higher Education who were pursuing a B.Ed. (Hons.) course. These two tools challenge the still existing transmission model of education within Higher Education in Malta that encourages rote-learning and memorisation of facts at the expense of reflective and critical thinking leading to transformation (See Chapter One & Two). Furthermore, based on Novak’s meaningful learning theory, these tools take into consideration three mental processes namely; cognition (thinking), conation (doing) and affectation (feeling). The LML system is presented in this study from my prior knowledge and experience (Vanhear & Borg, 2000) and as an effective tool in enhancing students’ learning through metacognitive strategies (Johnston, 1998, 2010; Osterman & Kottkamp, 2004, Vanhear, 2008). Furthermore, it was value added to this research since it is presented in the literature (see Chapter Two p.72-73 and Chapter Three p.107-108) as a tool based on a theoretical framework similar to Novak’s meaningful learning theory which promotes metacognition, is founded on constructivist notions and takes into consideration the three mental processes presented in this study, namely cognition, conation and affectation (Appendix A).

6.1 First phase – influence of teacher-student interaction on meaningful learning when mediated by metacognitive tools.

In Chapter One (p.7) I presented five objectives and it would seem, from the data collected and analysed during the first phase of the research through Action Research, that a convincing argument can be made that the objective “to present Vee Heuristics and Concept Mapping as two metacognitive pedagogical tools that lead to meaningful learning thereby challenging passive, rote and superficial learning” (see p.7) was achieved. Through the use of Vee Heuristics and Concept Mapping, prior experiences and knowledge were taken into consideration and meaningful knowledge was constructed. All this then served as a basis for new meaningful knowledge construction (see Chapter Four). Furthermore, the whole process of the Vee Heuristic exposes not only knowledge, but also feelings and what the learners do to learn meaningfully. Consequently, the objective of investigating "how Vee Heuristics and Concept Mapping can be more than simple cognitive tools" (see p.7) was validated. The following pages will explain in more detail how the objectives of this research (see p.7) were achieved.

Very often learning starts off with a question and Chapter Four exposes how the 'focus question' is placed at the top centre of the Vee since questions are what set off the inquiry that leads eventually to new knowledge (Novak, 1998; Chin et al., 2002). Focus questions lead the student to trigger off a process of reflection and so is a key step in the whole process. The shape of the Vee helped the students to clearly recognise and differentiate that both thinking (concepts and theories) and doing (methodology) are implicated in the process of constructing knowledge (Novak, 1998). The student work products analysed in Chapter Four illustrate that the left hand side of the Vee is the thinking part of the whole process, where the student is encouraged to stop and reflect upon what one already knows about the focus question. It also reveals one's relation to the question and why he/she wants to know more about this question; in this way, emotions are highlighted. Many lecturers get carried away by the content they want to deliver, and, very rarely, do they stop to consider how the student is feeling about what he/she is learning. Very often, lecturers tend to take for granted that students come to class all prepared and ready to take in the information we present to them. This is a very important factor to consider when planning lessons since it will directly affect learning. Too often, in the fast routine of lessons, the content becomes more important than the process, and lecturers tend to miss out on other major contributing factors in the learning process. A lesson might be very well prepared, but, many times, it is done according to the lecturers' own knowledge and experiences, and, too often, it ignores the students' prior knowledge and experiences and emotional commitment. In this way learning becomes superficial (Novak, 1998).

The left hand side of the Vee is also very effective in capturing how the student plans to learn, therefore responding to the action part of our learning (conation). It is evident from the analysis of data that students plan to learn in very different and distinct ways. The responses given in the Vee revealed that there were students who planned to ask the lecturer and the lessons would be enough. Others planned to learn by referring to books and the internet while there were some who preferred to see the relevance, of what they were learning, to their lives. Therefore, this part of the Vee helps the lecturer to plan a learning programme which would suit the different students' preferred way of learning, therefore increasing relevance, engagement and motivation.

The analysis of the students' work products presented in Chapter Four demonstrates that the right hand side of the Vee, shows the action part of knowledge construction taking place. One can, therefore, see what the student is doing to develop his/her own knowledge. In addition, the student can reflect and observe the development of the new knowledge taking place as opposed to his/her prior knowledge on the left hand side of the Vee. In this way, prior knowledge was developed; misconceptions were altered while new knowledge was constructed. Here, therefore, the transmission model of education is challenged since the students are encouraged to construct and develop knowledge on their own and consequently this process promotes learner autonomy. The lecturer is only facilitating this process by providing the necessary tools and using them with intention. It is argued that rote learning does not impart meaningful learning and one way of taxing this approach is through the use of metacognitive learning (see Chapter Two p.69-70). Research in this study, and elsewhere, reveals that Vee Heuristics promote metacognitive skills. The work products analysed in Chapter Four evidences that Vee Heuristics are a tool which effectively captures and reveals the interplay between what is known and what needs to be known. Vees trigger off a process where the students grow from the familiar to the unfamiliar and therefore serve as mental scaffolds thereby responding to Vygotsky's Zone of Proximal Development (see Chapter Two p.31). Moreover, the set of steps presented in the Vee also reveal explicitly the development of the learners' feelings about the issue under study and what kind of action they take so as to be able to learn meaningfully (Gowin & Alvarez, 2005). These work products evidence how Vee Heuristics take into consideration cognition, affectation and conation (Novak & Gowin, 1984; Novak, 1998; Gowin & Alvarez, 2005; Åhlberg & Ahoranta, 2002) and how by going through all the steps of the Vee one cannot disregard any of these mental processes (Vanhear, 2008). Moreover, this research demonstrates that the use of Vee Heuristics foster teacher and student interaction which lead to create meaningful knowledge through the negotiation of ideas (Gowin & Alvarez, 2005).

The findings and analysis in this chapter reveal how Concept Maps were used and placed as part of a Vee Heuristic to reveal explicitly the process of how one constructs and develops knowledge. This work builds and follows on the work of Åhlberg and Ahoranta (2002) (see Chapter Two p.54-56) who used Vee Heuristics and CMaps to develop metacognition in and through Geography (Larkin, 2010).

The Vees presented in Chapter Four depict that, within the whole process, a first Concept Map is constructed prior to the whole process and a second Concept Map, is then constructed, at the end of the whole process. From the comparison of these two Concept Maps, both the lecturer and the student can observe how their knowledge was constructed and developed. This is yet another key step in this whole process and it responds to Cañas and Novak's (2006) concept map-centred environment proposition where "the concept map evolves from an initial 'assessment' of what students know about the topic being studied to a knowledge model reflecting the students' progress" (Cañas & Novak, 2006:501). The data analysis indicates clearly that through Concept Mapping, misconceptions were detected and altered, while missing gaps of information were included and this is an ongoing process as learning continues, revealing that learning is continuous and never ending.

Furthermore, Concept Mapping may respond effectively to the development of a learner-centred approach and to teaching and learning which addresses learner variability and individual differences (see Chapter Two, p.39). Across a variety of settings, grade levels and content areas, the use of CMaps in the classroom has shown positive effects on personalised learning (Afamasaga-Fuata'I, 2009; Kinchin et al., 2000; Vanhear, 2008; Cañas et al., 2012; Correia et al., 2014; Vanhear & Reid, 2014). This is also substantiated in this research as discussed in Chapter Four. The Concept Maps analysed and presented in Chapter Four illustrate that notwithstanding the fact that there is one lecturer and one topic, each student portrayed a different concept map. The seven first concept maps, constructed before the learning programme which were analysed in Chapter Four, are different, revealing that each student had a different number of concepts about the topic under study. The seven second concept maps, constructed after the learning programme which were analysed in Chapter Four, illustrate how each student developed knowledge construction differently. This evidences what various other authors referred to in this thesis suggest, that is, that each learner responds to incoming information in different ways (Ornstein & Thompson, 1984; Novak & Gowin, 1984; Johnston, 1996, 2010; Brain, 2000; Matthews et al., 2000; Forsten et al., 2006, Sousa, 2006; Zajda, 2006; Brophy, 2010). Therefore, concept maps facilitated the understanding of the different personal structures of knowledge and how it developed for both the lecturer and the respective students.

A concept map is a type of node-link diagram that has labelled nodes to represent the concepts or ideas relevant to the topic under study. Links that represent the relationships between the concepts or ideas are included to indicate the nature of the relationship. This node-link-node representation promotes deep learning and challenges surface or superficial learning. Consequently, Concept Maps challenge rote learning, since, to create the link between two concepts, the student must have understood the concepts well. Many students tend to learn by rote chunks of information, without deeply understanding the meaning. Through Concept Mapping, students are encouraged to think reflectively and creatively, and to construct their own knowledge in a way that would make sense to them. In this way learning becomes less superficial. Furthermore, knowledge which is learned by rote tends to be forgotten quickly unless it is repeated several times (Chapter Two p.34). However, knowledge which is learned meaningfully, which is learned in a way that makes sense to the student, tends to last longer (Novak & Gowin, 1984). Learning by rote does not modify or delete faulty ideas, but Concept Mapping allows the student to reflect, evaluate, add, delete or modify the development of new knowledge (Hay et al., 2008).

Meaningful knowledge does not occur in a vacuum and, therefore, prior knowledge has to be taken into consideration if we expect meaningful learning to take place (Novak, 1998, Jarvis, 2012). The data analysis reveals that when students construct their own Concept Maps for a question or problem under study, they are displaying their prior knowledge since CMaps give a specific picture of what knowledge the student has and how this is being developed. As a result, the teacher and student can negotiate and plan together to build upon this. This is referred to in educational psychology as metacognition and scaffolding which is better known as Vygotsky's Zone of Proximal Development (see Chapter Two, p.31). The analysis of data demonstrates that when lecturers understand what students think about concepts or events under study, they can be in a much better position to pin-point any invalid ideas or missing information. Also, they will be able to formulate lessons better and to differentiate instruction according to the students' needs. This research reveals that meaningful learning is made visible when students are given the opportunity to construct a first Concept Map at the beginning of a learning programme to capture prior knowledge, and then develop this into a second Concept Map at the end of the learning programme. Similar results were reflected and substantiated by Balgopal and Wallace (2009).

Concept Maps are grounded in theories of how people learn. They have originated from a constructivist perspective theory of learning which holds that students construct their own knowledge, as opposed to the preceding dominant belief of knowledge as something that is acquired through direct transfer and rote learning (Gage & Berliner, 1998; Twomey Fosnot, 2005; von Glasersfeld, 2005). Constructivists suggest that prior knowledge is used as a framework to learn new knowledge. Furthermore, they suggest that how we think influences how and what we learn. This research evidenced that Concept Maps identify prior knowledge, the way we think and the way we see relationships in between knowledge. Nonetheless, although CMaps may be seen as an effective cognitive tool, this research also revealed that the actual process of constructing a Concept Map involves another mental process which in this research is referred to as conation (doing). Learners are actively engaged while constructing a Concept Map and they create it at their own pace. The CMapTools software features enhance this mental process by allowing different means of action and expression. This might also serve as a contributing factor for the development of visual literacy skills which, according to Hattwig et al., (2013), are essential for 21st century learners. This whole process will lend itself to the active participation of the students and will create an environment of learning where understandings are negotiated and knowledge is constructed as opposed to environments where students are "passive recipients of the wisdom of a single speaker" (Ramsden 2003:108).

This research illustrated that engaging the students in active participation increases their motivation to learn and so makes them more likely to learn, retain and process the information presented (Novak & Gowin 1984; Novak, 1998; Booth, 2011). The students were involved in the lessons and the activities were made interactive through the use of active participation strategies. This kept the students more attentive as evidenced in the responses to the right hand side of the Vee, their second Concept Maps and their reflections. This led the students to experience a positive feeling while constructing their own Concept Map and this is revealed in the students' reflections and may be also observed by comparing the first concept maps which were created before the learning programme and the second concept maps which were created after the learning programme. The result was learning enthusiasm, commitment and co-operation. Positive emotions enhance motivation and help the students to focus their attention on learning and a positive motivation practice improves performance and achievement (Hays, 2006). This cognitive and affective domain connection was explored through the use of Concept Maps and substantiated also by Balgopal and Wallace (2009) in the Environmental Education field to promote ecological literacy.

Novak's creation of Concept Maps emerged as a new paradigm in cognitive learning, highlighting the learners' internal mental processes as the major factor in learning. Novak's work has always, since its inception, referred to these mental processes as a complex interplay between thinking (cognition), doing (conation) and feeling (affectation) (Novak & Gowin, 1984). Nonetheless, some authors tend to highlight cognition and, to a lesser extent, conation at the expense of the importance of the role of affectation when using Concept Maps. The general discussions of results generated by some authors and researchers in the field of the use of Concept Mapping in education focused on concepts and propositions and their development, and showed that the uses of Concept Maps reveal personal complex structures of knowledge and how they are integrated and expanded within a learner's cognitive structure (see Chapter Two). This kind of research is valid and valuable, but it only presents results related to cognition, and misses out on showing how or what kind of other mental processes were involved in learning, thus limiting the potential of the use of Concept Maps. This may be because "most research in education is ***method driven*** rather than ***theory driven***" (Novak, 2010:20 original emphasis) and therefore, researchers using Concept Maps limited their use to what could be measured. As a result they overlooked or devalued the aspects of doing and feelings or emotions in the whole process (Forgas, 2000; Jarvis, 2006b; James, 2009). This research shows how, through the use of Concept Maps, not only thinking, but also feeling and doing are taken into consideration.

The student work products presented and analysed in Chapter Four reveal that Vee Heuristics and Concept Mapping are metacognitive tools that yield deep and meaningful learning. The process of using Vee Heuristics and Concept Maps, as presented in Chapter Four, exhibit not only a change in thinking and what the students are doing to learn, but also a change in engagement. The increase in engagement is not only observable in the Vee Heuristics and Concept Maps, but it is also reflected and reinforced through the students' own reflections. This process responds to what Reeve (2013) termed as agentic engagement where students actively contribute to the flow of instruction within the classroom through expressing their thoughts, feelings, and how they prefer to learn. Agentic engagement is considered by Reeve (2013:591) as "another student-initiated pathway to positive outcomes." Agentic engagement may be associated to the 'learner's voice' as presented in Chapter Two (p.38).

My prior knowledge of the Let Me Learn advanced learning system was crucial in this whole process since it facilitated my understanding of how students apply their thinking processes, presented on both sides of the Vee, in order to learn more effectively since it revealed how both the student and the lecturer made their learning mechanisms work most efficiently for them. With an awareness of the diverse students' learning patterns, I could make this whole process make more sense to the learners. Therefore, I was in a much better position to negotiate meanings and experiences in a way which was meaningful for the students. With such awareness, lecturers and students may form partnerships based upon the knowledge of each other's ways of processing incoming information. They are able to create an atmosphere in which they have the opportunity to formulate specific techniques and strategies for developing learning that makes sense to them, and, consequently, becomes more engaging and meaningful (Johnston & Johnston, 1997).

My interest in Let Me Learn emerged while I was studying for my first degree (B.Ed Hons. 1996-2000). Despite my efforts to prepare effective lesson plans, I could observe that I was not reaching all the learners in my class in the same way. Consequently, a number of students were being left behind. This was bothering me both for the students' and my sake. This was in Mezirow's words my 'disorienting dilemma' (see Chapter One p.4). Over time, particularly during my first degree (B.Ed. Hons) thesis, I realised that I was preparing lesson plans according to my own preferred way of learning whilst ignoring the fact that all learners process incoming information differently. In this way, many learners were left behind or built an image of themselves as non-learners. This has also been noted by Weimer (2002). Yet, everyone can learn and, if we want our learners to be successful, we have to understand how they learn!

Furthermore, I was unhappy with the prevalent learning styles theories for three main reasons. First, I encountered a vast literature where sometimes the definition of terms varied or confused terms with each other (Messick, 1976; Keefe, 1979; Griggs 1991; Snow & Jackson, 1992; Riding & Cheema, 1991). Second, I felt that these theories were making the learning process too simplistic, particularly when they close the learner into one single quadrant by assigning a label of what kind of learner he or she is. Third, they did not provide the learner with an intentional strategy that could be used so as to succeed; in this way, learning is still hindered.

Through the use of LML I observed that the students were not only informed about their own learning process, but they were also equipped with metacognitive strategies to be able to tackle different tasks in an effective way (see Appendix A.7.7). This system helped me to understand how and, consequently, respond more effectively to the different needs of the learners thereby reaching each and every learner (Ramsden, 2003; Eilks & Byers, 2009). Through this mutual understanding of how both the teacher and the learners may communicate more effectively, an accepting learning environment was created in the classroom (Wlodkowski, 2008). This system does not categorise people but, on the contrary, it was developed to include ***everyone*** as a potential learner.

On reflecting and observing that LML, Concept Mapping and Vee Heuristics were created on a common principle about learning (see Chapter Three p.108), I thought of merging these tools together. I am a reflective person; reflection is what drives me to improve professionally. I am referring to the reflection that refers to thinking about what one is doing with openness to being changed, a willingness to learn, and a sense of responsibility for doing one's best for the benefit of the learners (Jay, 2003:1). This kind of developmental change in my professional and educational journey is mirrored in Barr and Tagg (1995) who call for a paradigm shift in higher education through the learning paradigm which makes students discover and construct knowledge for themselves as opposed to the traditional instructional paradigm. In accordance with this premise and as a result of it, this research reveals that the merging of metacognitive tools yields fruitful results and enhances student/teacher interaction.

The analysis of data of the first phase research evidenced that learning is a very complex process and that each individual's mental processes are "as unique as our fingerprints" (Meyer et al., 2014). Through the use of these tools, the interaction with the students was enhanced, leading them to reflective and higher-order thinking and, eventually, to meaningful learning as substantiated by the Vee Heuristics, Concept Maps and the students' reflections. The use of metacognitive tools which were used with intention so as to take into consideration cognition, conation and affectation, yielded meaningful learning. As a result, the evaluation of the solution implemented (the learning programme) through action research was positive and therefore the objective "to test and apply an innovative model within Higher Education in Malta by merging the use of metacognitive tools" (see p.7) was implemented and yielded meaningful learning.

Nonetheless, as an educator, one must be ready first and foremost to change oneself since "if we want pupils to learn meaningfully and reflectively, then their teachers ought to first learn how to learn meaningfully and reflectively" (Åhlberg in Cañas et al 2004:39). Therefore, I reflected on the first phase of the research and on the understandings which were implicit in the data of analysis. This reflection led me to embody in further action (Schön, 1983; Jay, 2003) which helped me "to identify practical issues when applying this model" as stated in one of this research objective (see p.7). The next section presents the practical issues when applying this model and the conclusions for the second phase research and which demonstrate that Action Research is a cyclical process (see Figure 6.1).

6.2 Second phase – tools used by teachers to become reflective practitioners to enhance students' meaningful learning.

The first phase of this research highlighted student learning through the use of particular tools which take into consideration cognition, conation and affectation, so as to facilitate meaningful learning. The analysis of data presented during the first phase of the research has revealed that metacognitive tools used with intention (see Chapter Two p.42) enhance student learning through active participation and reflection. However, it undervalued the role of the teacher/lecturer. Students constitute an important part of the teaching environment for the teachers but teachers play an important role in the learning context for the students (Richardson, 2005). If we revisit the definition of meaningful learning as proposed by Novak (1998) (see Chapter Two, Figure 2.9, p.62), we will conclude that it also implies not only the importance of the role of the learner, but also the importance of the role of the teacher in the whole process. The tools presented in this research may be a way of helping, mentoring, supporting and empowering students to learn meaningfully. These tools are presented as a 'better' tool because they facilitate active participation from the students. Moreover, the analysis presented for first phase of my research revealed that these tools facilitated my understanding of how my students learned and as a result, I adapted my teaching to support this process and so, these tools helped me to encourage my students to learn better (Eilks & Byers, 2009). However, lecturers must see the purpose and the value of the tools they are using and make them work by at least using the tools to create an appropriate and effective interaction which would lead to meaningful learning.

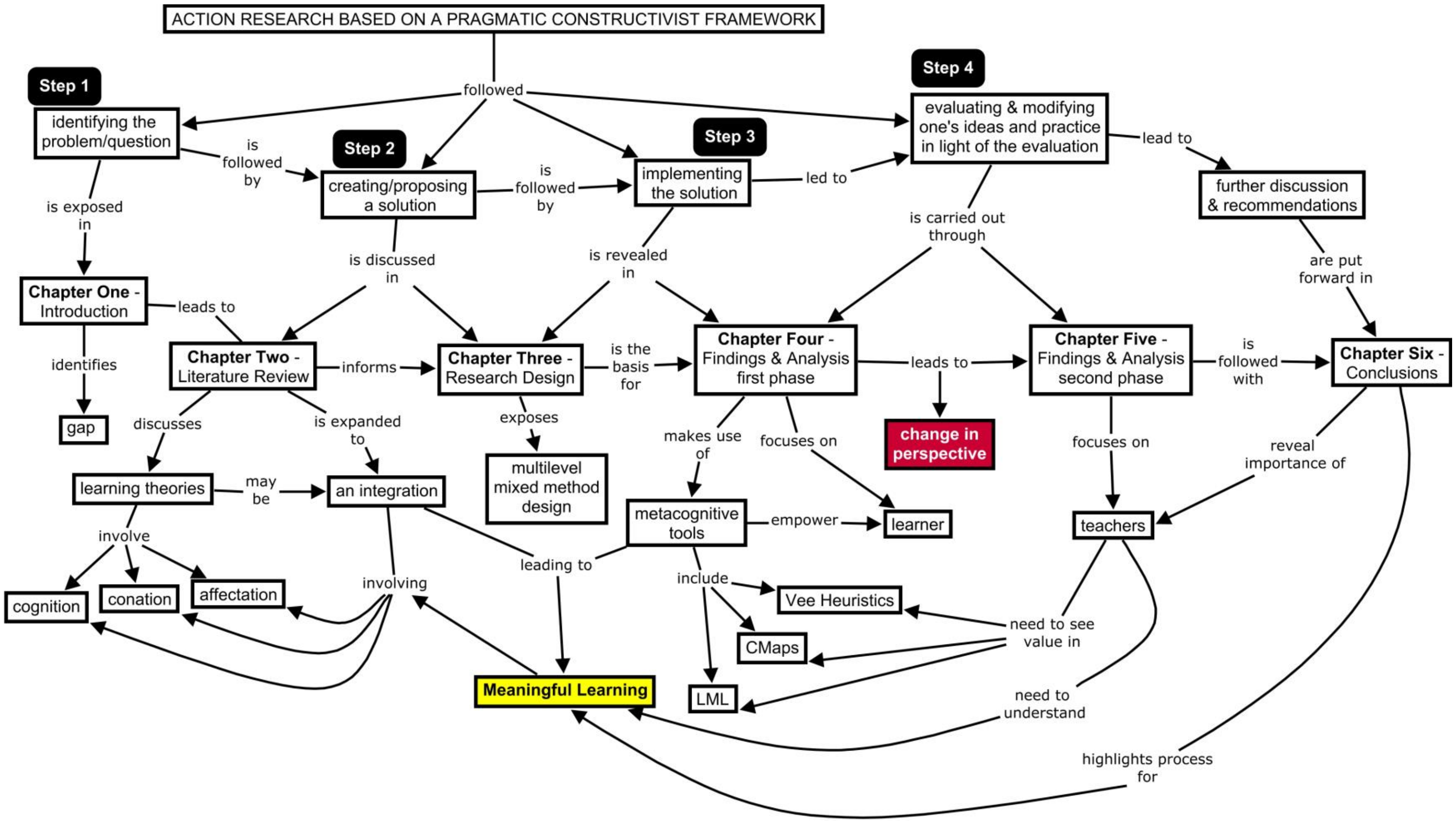

Figure 6.1: Action Research based on a pragmatic constructivist framework expanded to reveal the shuttling back and forth between my thinking and action.

If a lecturer is superficially engaged, meaningful learning will be limited, no matter which tool is used. Lecturers need to interact appropriately and effectively in order to understand how students learn meaningfully. Lecturers must be engaged deeply both in the subject and the learning process for meaningful learning to take place.

As various authors suggest (Prosser & Trigwell, 1999; Ramsden, 2003; Kinchin, 2004; Jarvis, 2006a, 2006b), separating learning and teaching within higher education is a myth, and engaging in reflective dialogue and interaction are contributing fundamental factors affecting the level of learning (Chapter Two p.70). Lecturers have to be reflective practitioners; they have to be critical about the learning process so that they will trigger off reflective questions on their own teaching. Such reflective practice is the basis of effective professionalism and expertise in whatever area (Schön, 1983; OECD, 2010 Biggs & Tang, 2011). Just as students are requested to be reflective, so must the lecturer be.

The data collected through the online inventory and analysed in Chapter Five revealed that although the lecturers tend to go for a deep approach to learning leading to students focused strategies (Prosser & Trigwell, 1999), this is done through an automated process, and not with a specific intention on the part of the lecturers. This was deduced from the various responses analysed in Chapter Five and which exposed a fragmented or incomplete notion of what deep learning is. It was further corroborated through their misconceptions about learning outcomes and the learning process. These findings expose the need for lecturers to learn, through doing research, how to improve on their knowledge and expertise about the learning process (Prosser & Trigwell, 1999). This should be recognised and supported by their University and/or institution which should encourage the idea of practitioners as researchers. Just as effective pedagogy promotes the active engagement of students as learners, so must Universities seek ways to encourage active engagement from the lecturers as researchers. Furthermore, the analysis of data in Chapter Five reveals that affective factors are disregarded or are not given their due importance as contributing factors for meaningful learning to occur. This is consistent with the literature research presented in Chapter Two. Consequently, the strategies that the lecturers use respond to a view of learning which takes into consideration only thinking and, to a lesser extent, doing. This may be one of the reasons why student teachers are not being prepared adequately enough during the four year B.Ed. course and may be one of the answers to the problem which this study identified in Chapter One. Overshadowing engagement in teaching and learning will produce superficial learning. The teaching process is very personal and idiosyncratic as evidenced in the data analysis in Chapter Five, and, therefore, lecturers need to gain more understanding about the learning process. As a result, they would then be able to select the tools and strategies which would work for them in such a way that they would become more engaged and use these with the intention to deliver meaningful learning. The teaching process becomes most effective when lecturers plan intentional approaches in response to how students are learning (OECD, 2010).

I started off this PhD research study with the primary intention to improve myself professionally and academically. Therefore, bearing belief that Vee Heuristics and Concept Mapping are metacognitive tools that lead to meaningful learning, I thought it would be appropriate to personally go through the whole process of the Vee Heuristics and Concept Maps where the focus question would be the major research question which has triggered off this study (see Figure 6.2).

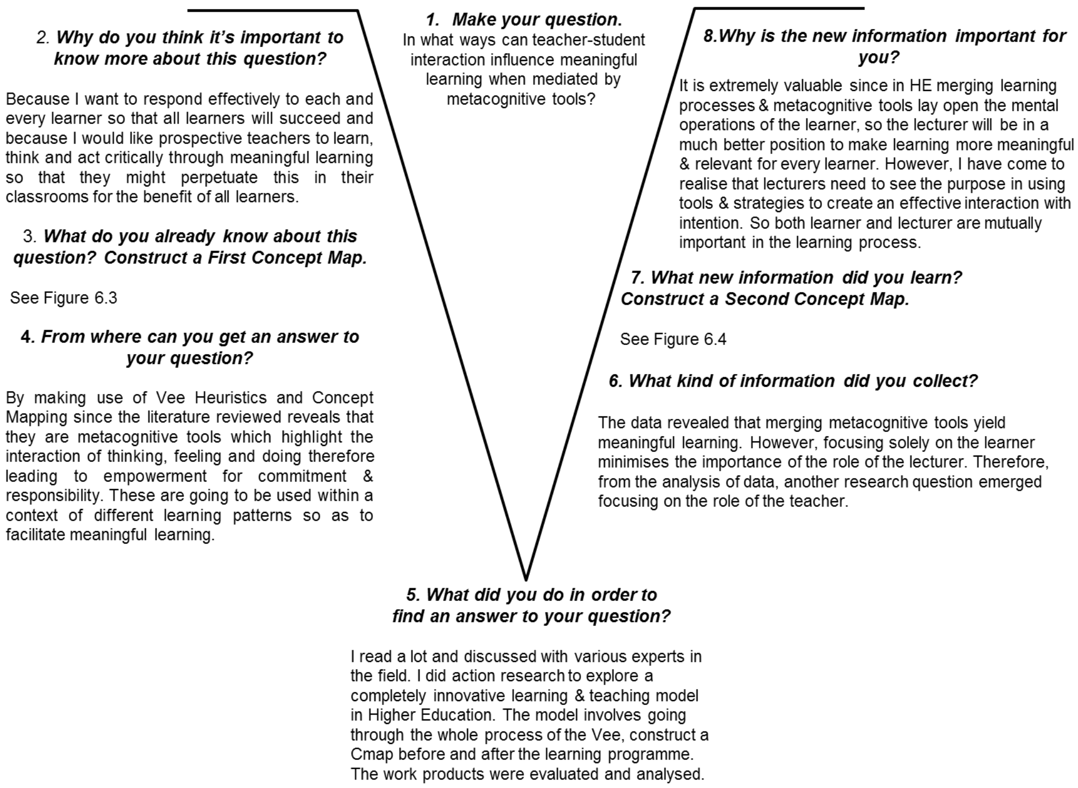

Figure 6.2: Vanhear's Vee Heuristic

The Vee Heuristic illustrated in Figure 6.2 reveals that I started off this research by fallaciously assuming that focusing solely on the learner would bring about meaningful learning. The tools I used based on my prior knowledge and experiences (see Figure 6.3) responded effectively to a theory of learning that takes into consideration cognition, conation and affectation. It is true that the model presented in this research yielded successful meaningful learning; however, one cannot assume that the same results will be produced if this model is used by other lecturers. The second phase research highlighted the importance of the role of the lecturer in the whole complex process of teaching and learning. So, it is valid to state that, as lecturers, we must focus on the learner but not at the price of minimising the importance of the role of the teacher/lecturer (Chapter Two p.77-78). Both students and lecturers are equally important, and they should be seen as partners in achieving the desired learning outcome.

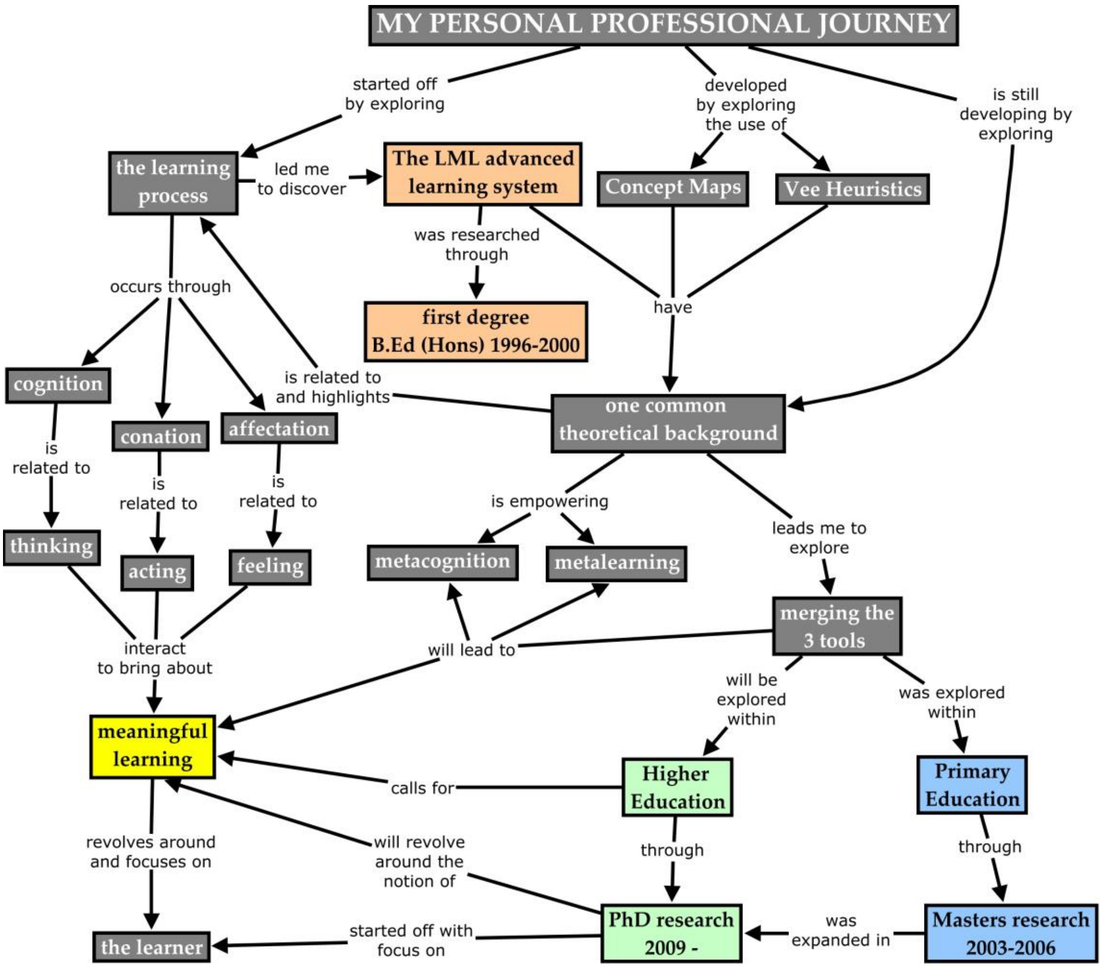

Figure 6.3: Vanhear's first Concept Map

Effective strategies and tools are important but they very much depend on the teachers' commitment and willingness to use them intentionally. Therefore, it is not a particular strategy or tool that matters most, but the teachers' belief that they are willing to use them with the intention to improve their practice to reach different learners. Consequently, Concept Mapping, Vee Heuristics and Let Me Learn have worked well for me and have yielded positive results. However, this does not necessarily mean that they are a quick fix tool. Nor does it necessarily mean that teachers will be willing to use them. If the teachers do not see the value of this metacognitive model, they will not implement it, or if they do, they will do so in a very superficial way. Therefore, my second concept map led me to revisit Novak's model of meaningful learning (see Chapter Two, Figure 2.9 p.62) and while I am not contesting what is represented in Novak's original concept map on meaningful learning, I think there is room for more development as emerged from my research (see Figure 6.4).

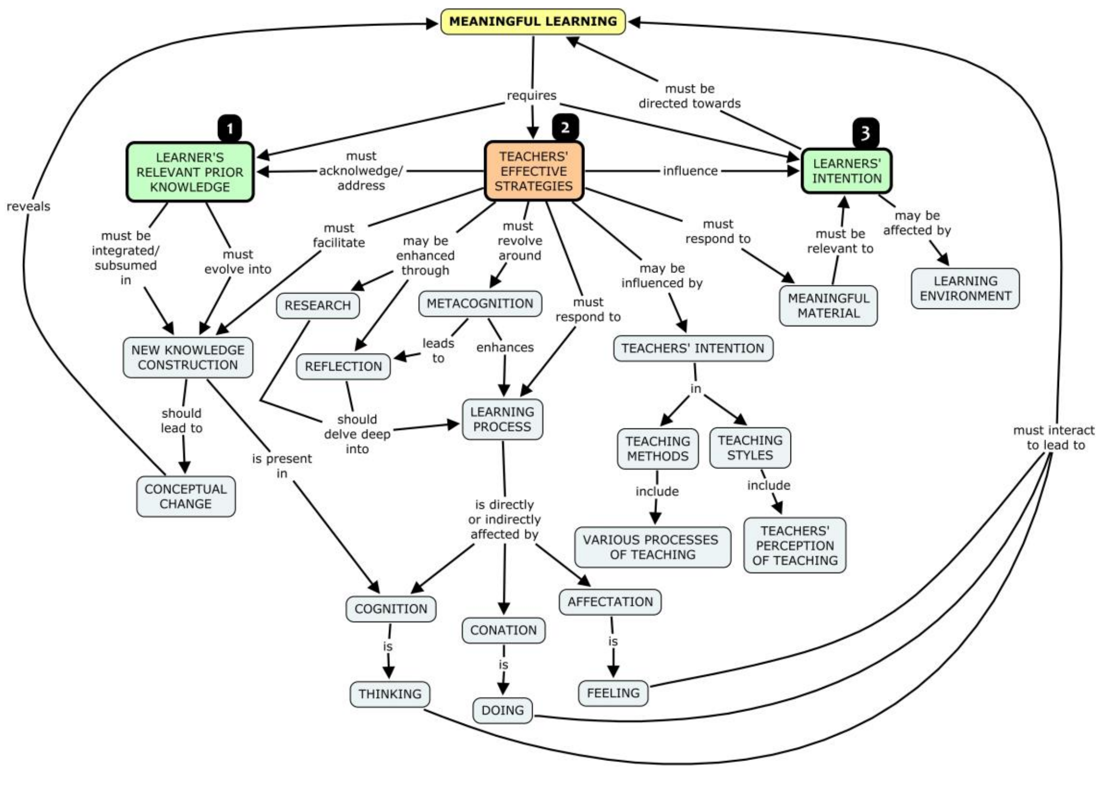

Figure 6.4: Vanhear's second Concept Map

This research is ground breaking in the Maltese educational context. It integrates the use of various metacognitive tools and processes that lead to meaningful learning and personal transformation in the higher education context. It simply focuses on the learning process rather than on content delivery. Literature on higher education calls for more emphasis on the student learning process through increased reflection and metacognition (Moon, 2004; Cowan, 2006; Race, 2010; Biggs & Tang, 2011). Yet with the ever increasing number of students in many university classes, we are having a mass production of passive intellectuals (Pinar et al., 1995). This research will hopefully serve as a stepping stone for future research in this area. My own personal reflective learning journey leading to a change in perspective: from learner centred to teacher/student interaction through intentional strategies and tools will, hopefully, encourage similar reflective practice leading to improvement in our educational system.

For a number of years, I have read and researched on how to become a more effective teacher. I looked for tools to help me understand and reach all of my students. I looked for strategies to improve my quality of teaching. The tools and strategies did help me improve my professional practice, but I have come to realise that at the heart of quality teaching lies one's continuous reflective approach about the learning process and one's own practice. I embarked upon this reflective learning journey with an open mind, sense of responsibility and wholeheartedness so as to improve the learning of my students (Dewey, 1933; Schön, 1983; Jay, 2003). I have positioned myself as a learner throughout the research process expecting to be transformed as well as to transform. I am influenced by Dewey (1933:9) who writes that reflective thought "is the active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends." Although these words were written several decades ago, I feel that they are still relevant today.

This research challenges the too often conventional and restrictive practices in the classroom where rote learning and passive learners are emphasised at the price of meaningful learning and active learners who commit themselves to think, act and learn critically. This research aims to enhance, validate and contextualise the application of the practice and the tools used and presented in this study to the theoretical educational research base.

6.3 Limitations and further research

The first phase research did not prove to have significant limitations since it took place in a natural setting and can therefore be easily reproduced. However, it would be worth investigating further whether these tools would yield the same results if used by another lecturer.

During the second phase of the research, although the lecturers interviewed revealed an incomplete understanding or misconceptions about the learning process yet they all referred to the importance of interaction, dialogue and students' active participation. Therefore, it would have been worthwhile if these lecturers had been observed during their lectures and an analysis carried out to explore whether deep, meaningful learning actually took place during their lectures. However, this could not be done because of lack of time and the need for brevity in the study. I feel that the secondary research question is so important that this research only scratches the surface of the discussion about this issue. Further research in this area is encouraged due to the importance of quality teaching and learning and the role of expert lecturers vis-à-vis the higher education experience and effectiveness. Kinchin (2015) comments, that student engagement has haunted universities for a long time. However, before teachers start to blame the students, they should evaluate their own practice in order to consider how they act as agentic teachers within their classrooms. For example, one could explore the use of technology during lectures, what kind of technology is used and how it is used, so as, to enhance teaching and learning (Hattwig et al., 2013).

This research did not take into consideration the assessment methods. Feedback and assessment are a source of influence on students' achievement (Hattie, 2003; Dweck, 2012; Hattie & Anderman, 2013). When exploring lecturers' effectiveness, one has to take into consideration the goals, methods, assessment and resources used. Another factor conducive to learning might be the physical classroom learning environment; however, this was not considered in this research. Similarly, gender was not considered as a variable in this study. Further research would be worthwhile in this area. For example, Novak and Musonda (1991:119) assert that they "observed that female students were generally more inclined to learn by rote than male students."

The above limitations further show the cyclical process of an action research (see Figure 6.1 p.214). This research started off with one research question and particular aims but through the analysis and discussion, other questions emerged which may evolve into another cyclical action research to be answered and lead to other related aims being discovered.

6.4 Conclusion

Higher Education must highlight quality of education not just certification, continuous appraisal not just exams, creativity and reflection not just memory work and dynamic and relevant learning not just prescriptive and detached teaching. This study progresses beyond past research in diverse ways and it reveals the importance of viewing learning as an interaction of thinking, feeling and doing. Each of these mental processes directly affects learning and, therefore, each one of these factors has to be considered for meaningful learning to take place. This research will hopefully shed some light on how Vee Heuristics and Concept Maps along with an awareness of how students' mental mechanisms work most effectively for them may lend themselves to a meaningful learning process leading to transformation for both the teacher and the student. These two tools merged together present a process of praxis which is "an activity that combines theory and practice, thought and action for emancipatory ends" (Kincheloe,2005:22). More importantly, these two metacognitive tools reveal what's going on in the learners' head so that they are empowered to embark upon a meta-learning journey. Consequently, the learners are better equipped and trained in decision making, reflective and problem solving skills. Furthermore, these two tools don't occur in a vacuum but they build on the learner's prior knowledge. They take into consideration the learners' diverse and personal experiences therefore making learning more meaningful. The intention is that this research will encourage lecturers in Malta to add these two tools to their repertoire of pedagogical tools.

As educators, we cannot keep disregarding the affective and conative factors in the learning process since they play a major role in the whole learning process. Although "the person is a complex phenomenon" (Jarvis, 2006b:195) and we do not have enough information to determine causal attributions to learning since "humanity and the human society are continually developing" (Jarvis, 2006b:200), research in neuroscience and elsewhere shows that cognition, affectation and conation cannot be studied as disparate elements, but one must analyse systems and networks of connections if one wants to understand how learning occurs and empower meaningful and expert learning experiences (Meyer et al., 2014). Such theories of learning emerged as paradigm shifts to consider learning as a complex, dynamic system of networks and mental processes that impact the process of thinking (cognition), doing (conation) and feeling (affectation).

Consequently, lecturers/teachers should be interested and should focus on an understanding, and/or be aware, of the process of learning rather than content acquisition alone so as to increase the quality of their teaching. This research shows that very often lecturers in higher education in Malta are inclined to neglect students' emotions despite their clear relevance to meaningful learning (Novak & Gowin, 1984; Meyer et al., 2014). This situation is apparently not novel or unique to Malta as evidenced in the literature presented in Chapter Two. Emotions are directly linked to motivation and can directly contribute to the development of students' interest in learning (Krapp, 2005; Pekrun, 2005). Shulman (2002) asserts that engagement is the fundamental goal of Higher Education and therefore it cannot be disregarded or overlooked.

These principles might seem too idealistic for some but I suggest that creating more of the same product will not suffice. The use of Vee Heuristics and Concept Maps integrated with an advanced learning system may bring about a change in Higher Education systems which would hopefully lead to creative and reflective practitioners in our society. This research just scratches the surface of teaching and learning in Higher Education. Nonetheless, hopefully it exposes innovative metacognitive tools which, if used effectively and with intention, can bring about meaningful learning in Higher Education. Furthermore, this research offers new ideas for the improvement of quality teaching and learning within Higher Education in Malta and contributes to international literature on teaching and learning in general and Vee Heuristics, Concept Mapping and the Let Me Learn advanced learning system in particular.

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APPENDICES

APPENDIX A

A.1 The Let Me Learn® Advanced Learning System and how it is used in classrooms

The Let Me Learn (LML) process is an advanced learning system that assists individuals in understanding by using their learning processes with intention and through metacognitive strategies in order to succeed in any learning task. In the coming paragraphs I shall be discussing in detail what LML is all about and I will discuss why it is different from other learning styles and consequently why and how it claims to be an advanced learning system.

A.2 I think, I do and I feel therefore I learn

The theoretical basis of the Let Me Learn Process is the Interactive Learning Model© (Johnston, 1994). The Interactive Learning Model portrays learning as a process occurring through the simultaneous interaction of three mental processes namely: Cognition (I think), Conation (I do) and Affectation (I feel). This tripartite theory of the mind received attention from various perspectives and fields of study, such as philosophers like Plato and Kant, cognitive psychologists like Jung, Snow and Jackson from the cognitive field (Snow & Jackson, 1992), learning style theorists like Keefe and Languis (1983) and brain-based learning researchers such as Maclean (1978). Similarly, Jarvis (2006b:23) in his concern to understand learning suggests that one transforms one's own experiences through thinking, feeling and acting (see Figure A.1) and states that "as individuals are thinking, feeling and acting beings, we transform our experiences through all these dimensions, often simultaneously."

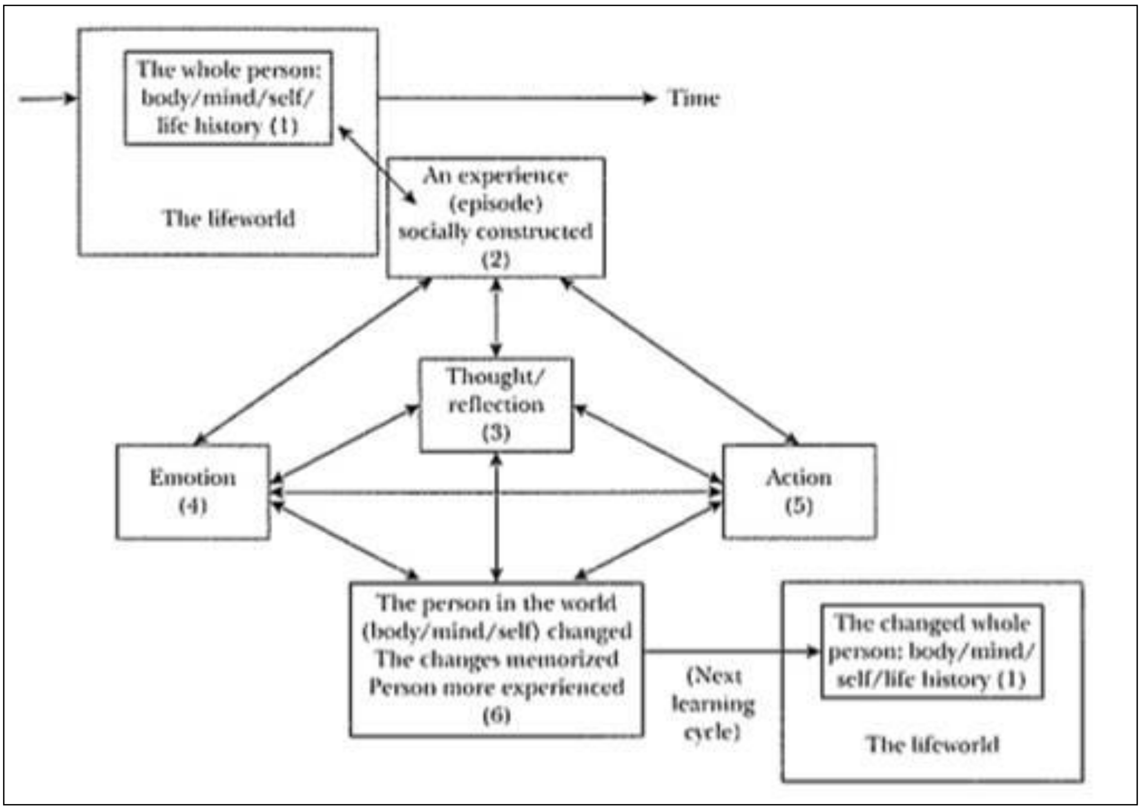


Figure A.1: The transformation of the person through learning as presented in Jarvis, 2006:23

As we have read in Chapter Two, there are many researchers who have contributed to our understanding of how learning occurs by focusing on an aspect or another, but there are few who have developed a connected explanation of an individual's mental operations (cognition, conation and affectation) and resulting learning processes i.e. how an individual takes in the world around him/her, makes sense of it and responds to it in appropriate ways. Johnston's work brings together earlier notions of learning (Piaget, 1952; Jung, 1923; Flavell, 1980; Kant, 1988; Snow & Jackson, 1992; Keefe & Languis, 1983; MacLean, 1978; Bruer, 1993; Dien et al., 2008; Flavell et al., 2000; Gardner, 1983; Sternberg, 1996) so as to respond to the void that "exists in both the literature and the practice of educators concerning how to identify an individual's learning process" (Johnston, 1994: n.p.) (see Figure A.2)

During the summer of 2009, I was invited to give an in-service course to a group of teachers regarding the learning process and I started off my talk by posing the following question: "How do you think learning takes place?" The answers I was given were similar to the following "absorption, sorting, associations, assimilations, passing of information, drilling/repetition, asking questions". One can easily observe that all these responses belong to only one mental process namely, cognition. However, if we look only at the cognitive part of the learner, we would be like looking at a silhouette of who the learner really is. In reality, we are quite familiar with cognition but we tend to brush aside conation and affectation while we do not always approach learning with an equal understanding or giving weight to each of these three mental processes. For example, behavioural models of learning emphasise performance while ignoring cognitive processes and affective factors whereas on the other hand cognitive models of learning emphasise cognition without taking into consideration the affective or conative aspect of learning (Jarvis, 2006b).

Figure A.2: The three mental processes involved in the LML learning process (Johnston,2010)

A.3 Cognition

Cognition refers to the process of coming to know and understand; the process of encoding, storing, processing, and retrieving information (Huitt, 1999). It is the way in which we come to understand the world around us; the way in which we process stimulus. It is generally associated with the question “what do I know?” and in Johnston’s words “the cognitive voice is the sifter of information and experience-the executive office of the brain that contains the rational and thought centre of learning” (Johnston, 1998:20).

Nevertheless, the processing of information is but one aspect of our overall learning process and it is the one, which our educational system puts emphasis on. One of the reasons why cognition is highlighted may be because it can be easily measured unlike other mental processes such as affectation.

A.4 Conation

The function of **conation** within our learning process requires more extensive explanation than cognition since it is the least familiar of the three mental processes. Conation derives from the Latin word 'conatus' which means 'effort or undertaking' and in fact it is the action part of our learning. Johnston refers to conation as "the choreography of learning rather than the lyrics…..- the conative voice of learning is the most observable but not the most articulate" (Johnston, 1998:22). Conation establishes the pace with which we use our own personal 'tools', as well as the autonomy we exercise when learning. The word 'tools' in this context refers to the ways we arrive to learning. Not all children grab new concepts or new knowledge at the same rate, some are rapid responders whilst others prefer to take their time and maybe reconsider their options (Matthews et al., 2000).

Caine and Caine (1991: 101) claim that these "natural procedures for action appear to form a bridge between the cognitive and the affective aspects of the learning process." According to Huitt (1999) Conation refers to the intentional and personal motivation of behaviour (e.g., the proactive direction, energizing, and persistence of behaviour). Conation is generally associated with self-direction, self-regulation and self-direction. Teachers tend to label 'bright children' according to their natural pace, but taking time to respond does not necessarily mean that the student is not learning. Some children learn best when they work in groups and are allowed to exchange ideas, while others prefer to stay apart and try to figure things out by themselves. The use of personal 'tools' is an important aspect of the learning process and therefore it cannot be ignored. We all have these 'tools', however learners do not use these 'tools' with the same clarity or agility as others. The outcome is that the performance of a learning task will vary from learner to learner not because of a lack of cognitive ability but because the 'tools' required are not used with the same degree (Matthews et al., 2000).

A.5 Affectation

One may process the world around through cognition or perform one's learning through conation using one's own natural pace, autonomy and personal 'tools'. However, if one does not value who one is as a learner, one will keep oneself hidden, one will go inside oneself and one will resign oneself to being a non-learner (Sigelman & Rider, 2011; Dweck & Masters 2008; Brophy, 2010). Slavkin (2004) and Huitt (1999) reveal that cognition and affectation are inherently tied to one another. As I have discussed previously in Chapter One, Sigelman & Rider (2011), Dweck & Masters (2008) and Brophy (2010) claim that many learners who experience failure tend to attribute this failure to their lack of ability and consequently they are disheartened and tend to stop trying and avoid challenges. Furthermore, Slavkin (2004:4) argues that “many students today feel emotionally disconnected from learning.”

Much of the literature of educational and cognitive psychologists is devoted to explaining that what the learner values and how the learner perceives his or her capacity to learn, affects the learner’s motivation to learn. This is very often referred to as perceived self-efficacy (Bandura, 1994) and this is what the third mental process, affectation, is all about. **Affectation** refers to the emotional interpretation of perceptions, information or knowledge. It is generally associated with one’s attachment (positive or negative) to people, objects, ideas etc.…and asks the question “How do I feel about this?” As Johnston puts it “the operative word is successful…success pumps up the learner’s energy level and prepares the learner to take on the next challenge” (Johnston, 1998:22). The learner’s affectation is really a barometer of the learner’s confidence – a personal sense of how well one can succeed at any learning task.

The Let Me Learn System is built around a conceptual framework where learning is defined as “taking in the world around you and making sense of it so that you can respond in an appropriate manner” (Johnston 2007:1). Most various other measures of personality, multiple intelligences and learning styles compartmentalise learners but LML builds on the Interactive Learning Model (see Figure A.2) and suggests that through the interaction of these three mental processes, learning patterns are formed namely: Sequence, Precision, Technical Reasoning and Confluence (see Figure A.3).

While these patterns are universal across race, gender, and ethnicity (Johnston & Dainton, 2005; Johnston, 1998:44), their make-up and use is very person-specific (Johnston & Dainton, 2005). Johnston refers to these patterns as our “universal, person-specific patterns” (Johnston, 2010). Calleja (2010) states that Johnston borrowed the term “patterns” from Philips (1936) and that she refers to these patterns as “patterned action tendencies.” The point to be emphasized here is that these four learning patterns work as a team. This is to say that we use all these patterns in concert but to varying degrees. Therefore, it is not accurate to say that a learner is, for example, a “confluent learner” or a “sequential learner”. More exactly, a learner may use one or more of them first and one or more of them as needed and a learner may avoid one or more of them. Rather than categorizing or placing a learner into one single quadrant, Let Me Learn emphasizes that every learner uses all of these learning patterns but to varying degrees.

More importantly, Johnston posits that the interplay occurring through the use of the three mental processes: Cognition, Conation and Affectation, are internal operations of our learning patterns (see Figure A.3). Johnston (1994a: n.p.) claims that it is “a composite of all four of these operational processes which make up an individual’s interactive learning process.” In this premise, it is important to recognize that the interactive learning process does not occur on a random basis but:

> it occurs as a pattern of behaviours. These patterns of characteristics are woven together by individual threads. In the case of learning patterns, the threads consist of cognition, conation and affectation….interactively, these patterns involve the learner in processing, performing, and reflecting on the basis of sequence and organisation, specificity and precision, technical performance and reasoning, and confluence and intuition.
>
> (Johnston & Dainton, 1996:6)

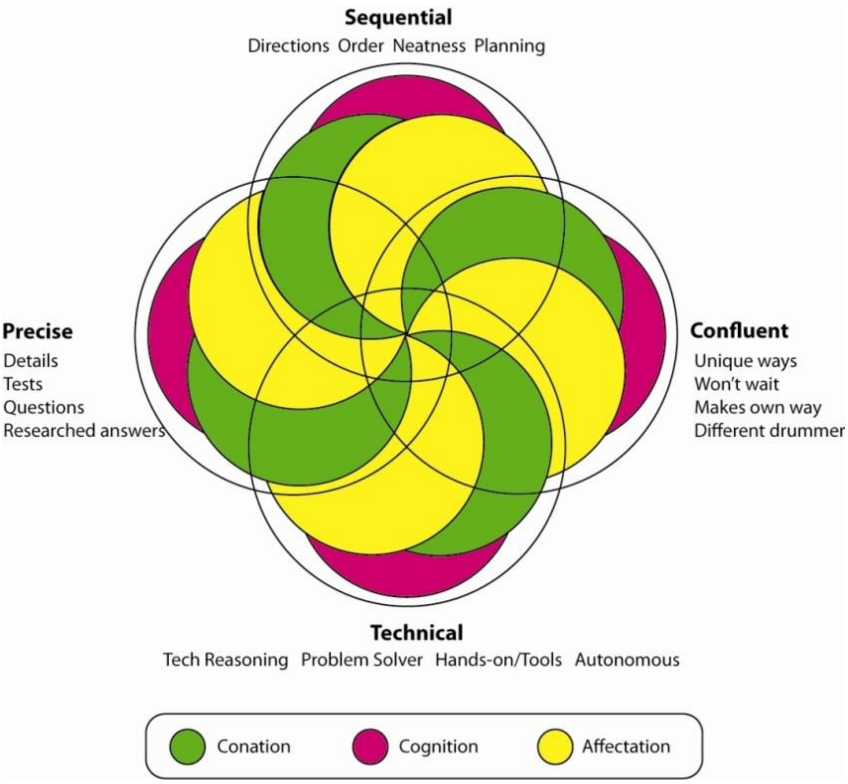


Figure A.3: Mental processes that operate within each learning pattern

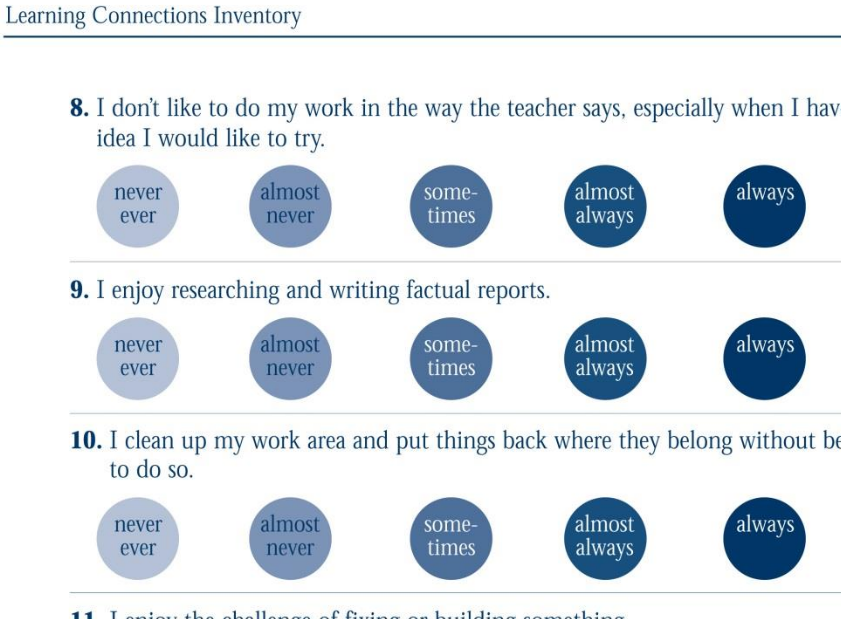
Calleja (2010:n.p.) explains that

> according to Johnston's conceptualization cognitive processing occurs within each of the four operational patterns in the form of mental activity, memory, range of experiences, and level of abstraction and concreteness. Within these same four operational patterns is found conative performing which manifests itself as autonomy, pace, and engaged energy. Finally, the four operational learning processes consist of affectation from which comes a sense of self worth as a learner and all attendant emotive responses to learning.

The purpose of the Let Me Learn process is to help individuals learn how to use their combination of patterns and internal workings of each, effectively, in order to take in the world around them and respond in a timely appropriate and efficient manner.

A.6 The Learning Connections Inventory (LCI).

To measure the degree to which each learner uses each of the patterns, Johnston & Dainton (1997) developed the Learning Connections Inventory (LCI) which has withstood empirical and theoretical testing for more than ten years in different countries around the world (Johnston, 1994, 1997; Johnston & Dainton, 1997, 2005; Calleja, 2010). The LCI consists of 28 descriptive statements which the learner indicates his/her responses on a 5 point numerical continuum (refer to Figure A.4) and at the end the respondents are asked to answer 3 open ended questions (refer to Figure A.5). Tallying an individual's responses to the LCI produces a score for each of the four learning patterns (refer to Figure A.6). The scores reveal whether one uses a learning pattern at a "Use First" level, "Use as Needed" level or seek to "avoid" it altogether: a score of 7 – 17 indicates Avoid; a score of 18 – 24 indicates Use As Needed and a score of 25 – 35 indicates Use First (Johnston & Dainton, 1996) (refer to Figure A.7). The results revealed on the score sheet do not categorise or place a learner into one quadrant but instead they emphasise that every learner possesses each of the four different learning patterns and uses each of these in concert and to varying degrees along a continuum.


Learning Connections Inventory

8. I don't like to do my work in the way the teacher says, especially when I hav
idea I would like to try.

never ever | almost never | some-times | almost always | always

9. I enjoy researching and writing factual reports.

never ever | almost never | some-times | almost always | always

10. I clean up my work area and put things back where they belong without be
to do so.

never ever | almost never | some-times | almost always | always

Figure A.4: Sample items from LCI Form II (Johnston, 2009)

The responses given to the short-answer questions are examined with a set of protocols that indicate the use of specific Learning Patterns (see Appendix L). These will serve for internal validity checks to demonstrate whether the individual's self-generated responses do or do not support the forced-choice answers. Other data, including face-to-face discussions of scores, observations of learner behaviours and examination of work products from varied learning tasks are used to validate the LCI scores. The LCI is presented in different forms in order to respond appropriately to different age groups. Therefore one finds LCI Form I which is used in the primary, LCI Form II which is used in the secondary, LCI which caters for adults and finally another LCI which caters for professionals. Nowadays, we find validated translations of the LCI such as in Italian, Spanish or Maltese.

Part II

Answer each of the following questions using the space provided. Write as much as you need until you feel comfortable that you have answered the question.

1. What makes school assignments difficult for you?

2. If you could choose, what would you do to show your teacher what you have learned?

3. What hobby or sport do you do well? How would you teach someone else to do it?

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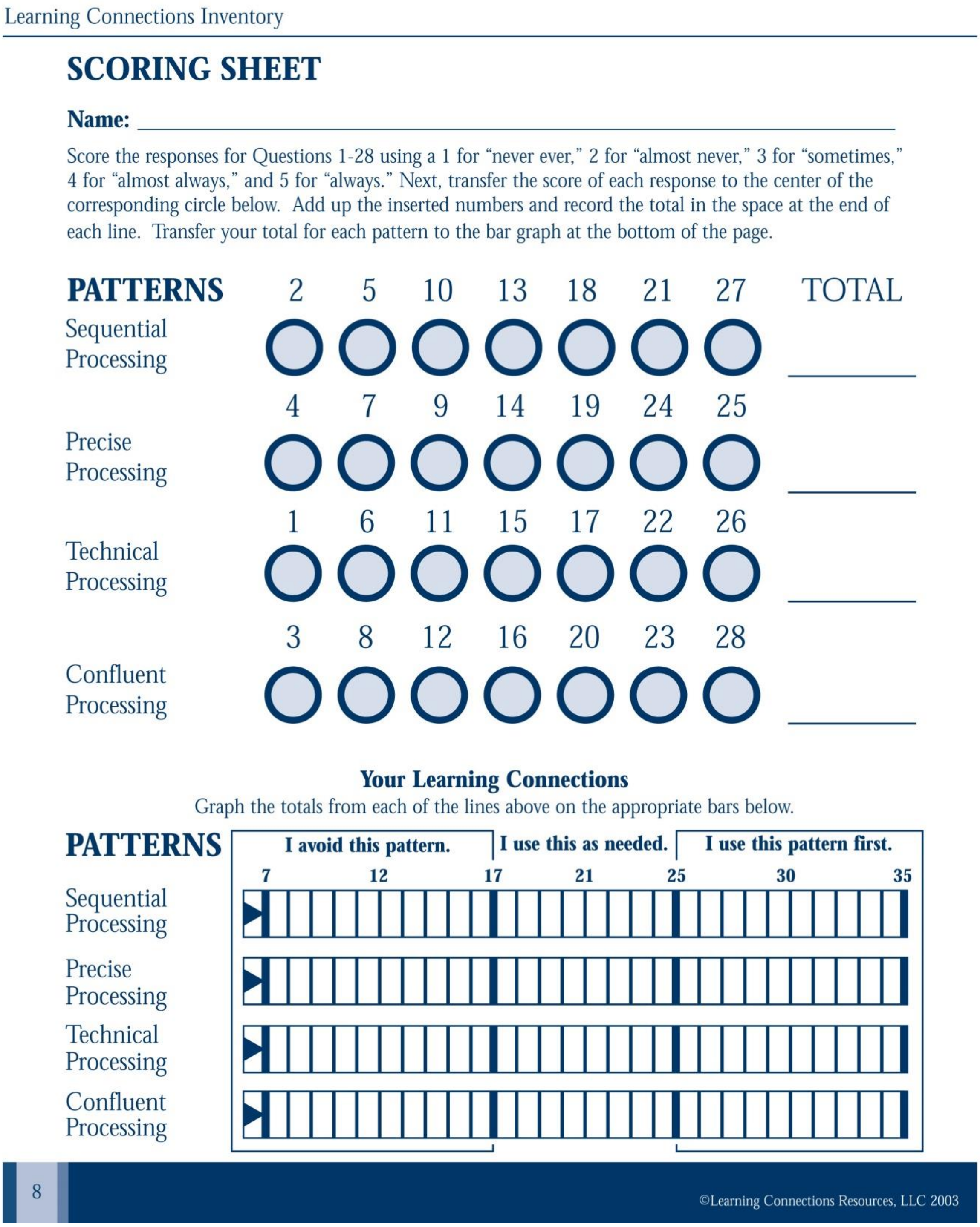
Figure A.5: The three open-ended questions to check for internal validity



Learning Connections Inventory

SCORING SHEET

Name: ______________________

Score the responses for Questions 1-28 using a 1 for "never ever," 2 for "almost never," 3 for "sometimes," 4 for "almost always," and 5 for "always." Next, transfer the score of each response to the center of the corresponding circle below. Add up the inserted numbers and record the total in the space at the end of each line. Transfer your total for each pattern to the bar graph at the bottom of the page.

PATTERNS								TOTAL
Sequential Processing	2	5	10	13	18	21	27	______
Precise Processing	4	7	9	14	19	24	25	______
Technical Processing	1	6	11	15	17	22	26	______
Confluent Processing	3	8	12	16	20	23	28	______

Your Learning Connections

Graph the totals from each of the lines above on the appropriate bars below.

8

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Figure A.6: Pattern scores and ranges on the LCI score sheet.

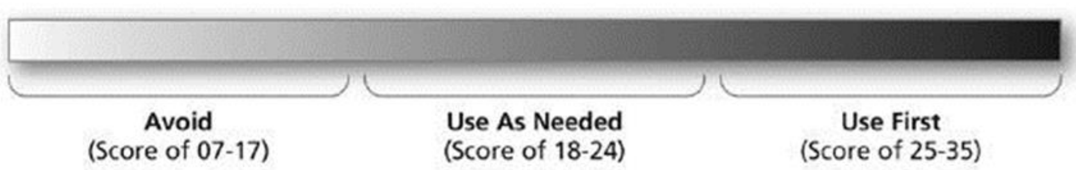


Figure A.7: Pattern Score Ranges or Levels for LCI Patterns (Dawkins et al., 2010; Johnston, 2009)

A.7 Validity and Reliability of the Learning Connections Inventory

From personal communication with Johnston I came to know that the person who helped in developing the LCI scale is a renowned psychometrician, originally from Rutgers University and ultimately from Ohio State University, Dr. Jeff, K. Smith. He has been editor in books of tests and measurements (Smith et al., 2001). In terms of the LCI scale itself, the work of developing the instrument began in 1990 and continued through 1996 before it was formally published. It has gone through numerous iterations and tests all of which helped to shape the scale that was developed for determining the ranges for Avoid, Use as Needed and Use First (Johnston, 1994, 1997; Johnston & Dainton, 1996, 2005; Calleja, 2010). First entitled the Learning Combinations Inventory and now called the Learning Connections Inventory is the empirical instrument designed to provide learners of all ages with their interactive learning profile of all the four operational patterns. The LCI empirically reveals, for instance, that the use of a pattern at an 18 is very different than the use of the same pattern at a 24; in other words within a given range there is a difference in the degree to which and the components of which an individual uses a specific pattern. This is one of the key aspects that make this scale so very sensitive and accurate. The responses given to the statements are coupled with the internal check of the three short answer questions which allows for the internal validity check.

Empirical evidence provided by any learning instrument or programme is crucial according to Coffield et al. (2004a, 2004b). Multiple measures of validity and reliability were carried out over the period 1994 – 2006, along with teachers and administrators at 19 national and international sites including faculty of Education at the University of Malta; Queens University Belfast; St. Johns York University, UK; University of Tarragona, Spain; Hofstra and Adelphi Universities, NY, and the University of South Florida have tested the validity and reliability of the LCI. Gathering results from over 15,000 six to eighteen year old students (including regular education, special education, dispraxic. neurologically impaired students, and Westinghouse National Science scholars) and 7,000 adult professionals, researchers from these institutions have directed a research agenda which has established the validity and reliability of the Learning Connections Inventory and the LML Process in K-16 faculty and staff development and corporate human resource training. The Learning Connections Inventory Manual (Johnston & Dainton, 1997, 2005) contains the original studies of validity and reliability. Furthermore, Calleja

(2010) provides a detailed journey of the construct validity and reliability of the LCI throughout the years.

A.8 Learning through our patterns

The first and most important LML skill involves understanding the depths and intricacies of each pattern. Having developed this skill, one would be aware of how the team of patterns work within oneself. Following is a description of each learning pattern as well as the specifics of the nature of thought, action and feeling that characterizes it.

A.8.1 Sequence

If your scale score for Sequence is between 25 and 35, you use your Sequence at a Use First Level (see Table A.1). This indicates that you want:

- clear step by step directions
- time to do your work neatly
- your work to be done from beginning to end
- to know whether you are meeting the teacher's/instructor's or boss' expectations
- to see a sample of what is expected from you

(Dawkins et al., 2010; Johnston, 2009)

How you think	How you do things	How you feel	What you might say
I organize information I mentally categorize data I break tasks down into steps	I make lists I organize I plan first, then act	I thrive on consistency and dependability I need things to be tidy and organized I feel frustrated when the game plan keeps changing I feel frustrated when I'm rushed	Could I see an example? I need more time to double-check my work Could we review those directions? A place for everything and everything in its place What are my priorities?

Table A.1: If you use Sequence First (Dawkins et al., 2010; Johnston, 2009)

However, if your scale score for Sequence is 17 – 7, you avoid Sequence (see Table A.2). This indicates that you do not:

- value directions
- live or plan by a schedule
- double check your work
- follow instructions easily

(Dawkins et al., 2010; Johnston, 2009)

How you think	How you do things	How you feel	What you might say
These directions make no sense! I did this before. Why repeat it? Why can't I just jump in?	Avoid direction; avoid practice Ignore table of contents, indexes, and syllabi Leave the task incomplete	Jumbled Scattered Out of synch Untethered Unfettered Unanchored	Do I have to do it again? Why do I have to follow directions? Does it matter what we do first? Has anybody seen my keys? They're not where they're supposed to be.

Table A.2: If you Avoid Sequence (Dawkins et al., 2010; Johnston, 2009)

A.8.2 Precision

If your scale score for Precision is between 25 and 35, you use your Precision at a Use First Level (see Table A.3). This indicates that you want to:

- receive thorough explanations
- ask a lot of questions
- answer questions
- be accurate and correct
- analyse test results
- have written documentation
- look for more details

(Dawkins et al., 2010; Johnston, 2009)

How you think	How you do things	How you feel	What you might say
I think in information. I ask lots of questions. I leave no piece of information unread. I think knowing facts means I am smart.	I challenge statements and ideas that I doubt. I prove I am right. I document everything. I write things down. I write long messages.	I thrive on knowledge. I feel good when I am correct. I feel frustrated when incorrect information is accepted as valid. I feel frustrated when people do not share their information. I hate being "out of the know."	I need more information. Let me write up the answer to that. My notes read differently. What I have is… Wanna play trivia? I'm currently reading three different books. Did you know that….? Actually…

Table A.3: If you use your Precision First (Dawkins et al, 2010; Johnston, 2009)

However, if your scale score for Precision is 17 – 7, you avoid Precision (see Table A.4). This indicates that you:

- rarely read for pleasure
- do not attend to details
- find memorising tedious and a waste of time
- hear wordy conversation as "blah, blah, blah."

(Dawkins et al., 2010; Johnston, 2009)

How you think	How you do things	How you feel	What you might say
Do I have to read all of this? How am I going to remember all of this? Who cares about all this 'stuff'?	Don't have specific answers. Avoid debates. Skim instead of read details. Take few if any notes.	Overwhelmed when confronted with details. Fearful of looking stupid. Angry at not having the 'one right answer'.	Don't expect me to know names and dates! Stop asking me so many questions! Does it matter? I'm not stupid!

Table A.4: If you Avoid Precision (Dawkins et al., 2010; Johnston, 2009)

A.8.3 Technical Reasoning

If your scale score for Technical Reasoning is between 25 and 35, you use your Technical Reasoning at a Use First Level (see Table A.5). This indicates that you:

- look for relevance and practicality to everyday life
- need to see the purpose of what you are doing
- do not use a lot of words
- do not feel the need to write things down
- believe you can fix things
- prefer to work by yourself

(Dawkins et al., 2010; Johnston, 2009)

How you think	How you do things	How you feel	What you might say
I seek concrete relevance – what does this mean in the real world? I only want as much information as I need – nothing extraneous.	I get my hands on things. I tinker. I solve the problem. I do! I figure things out. I work in my head and then with my hands.	I enjoy knowing how things work. I feel good that I am self sufficient. I feel frustrated when the task has no real world relevance. I enjoy knowing things, but I do not feel the need to share that knowledge.	I can do it myself. Let me show you how… I don't want to read a book about it, I want to do it. How will I ever use this in the real world? How can I fix this? I could use a little space.

Table A.5: If you use your Technical Reasoning First (Dawkins et al., 2010; Johnston, 2009)

However, if your scale score for Technical Reasoning is 17 – 7, you avoid Technical Reasoning (see Table A.6). This indicates that you:

- hire others to do building and repair work.
- do not get involved in taking things apart to see how they work.
- do not venture into the tool aisle.
- problem solve with others, not alone.
- find it difficult to understand why some people use few words to express themselves.

(Dawkins et al., 2010; Johnston, 2009)

How you think	How you do things	How you feel	What you might say
Why should I care how this works? Somebody has to help me figure this out! Why do I have to make something; why can't I just talk or write about it?	Avoid using tools or instruments. Talk about it instead of doing it. Rely on the directions to lead me to the solution.	Inept Fearful of breaking the object, tool or instrument. Uncomfortable with tools; very comfortable with my words and thoughts.	If it is broken, throw it away! I'm an educated person; I should be able to do this! I don't care how it runs; I just want it to run!

Table A.6: If you Avoid Technical Reasoning (Dawkins et al, 2010; Johnston, 2009)

A.8.4 Confluence

If your scale score for Confluence is between 25 and 35, you use your Confluence at a Use First Level (see Table A.7). This indicates that you:

- thrive in generating new ideas
- use imagination to a high degree
- like risk-taking opportunities
- do not fear failure but see it as an opportunity to learn and grow
- prefer not to follow the rules
- would like to be different and unique

(Dawkins et al., 2010; Johnston, 2009)

How you think	How you do things	How you feel	What you might say
I read between the lines. I think outside the box. I brainstorm. I connect things that are seemingly unrelated.	I take risks. I might start things and not finish them. I will start a task first – then ask for directions.	I am not afraid to fail. I enjoy improvisation. I feel frustrated by people who are not open to new ideas. I feel frustrated by repeating a task over and over.	What do you mean, "that's the way we've always done it"?! The rules don't apply to me. Let me tell you about.... I have an idea....... I have another idea!

Table A.7: If you use Confluence First (Dawkins et al., 2010; Johnston, 2009)

However, if your scale score for Confluence is 17 – 7, you avoid Confluence (see Table A.8). This indicates that you:

- think that taking risks is foolish and wasteful
- would rather NOT make mistakes
- are cautious in how you go about making life decisions

(Dawkins et al., 2010; Johnston, 2009)

How you think	How you do things	How you feel	What you might say
Where is this headed? Where is the focus? What do you mean, imagine?	I don't take risks. I avoid improvising at the last minute. I look for and want clear parameters.	I feel unsettled. Things seem so chaotic. My head is in a whirl! No more change or surprises, please!	Let's stay focused! Where did that idea come from? Now what? This is out of control!

Table A.8: If you Avoid Confluence (Dawkins et al., 2010; Johnston, 2009)

A.8.5 Patterns in the Use As Needed Range

If any of your Patterns are in the 18-24 scale range, then they are Use As Needed. You can use them when you need to. You just don't feel a great urgency to do so, especially if they fall into the 18-21 range. These patterns tend to lay dormant until you need to wake them up and let them know that you need to use them 'now'. (Dawkins et al., 2010; Johnston, 2009)

A.8.6 Different Patterns Combinations

A.8.6.1 Dynamic Learner

If you use one or two of your Patterns at the Use First level and any other combination of the remaining Patterns at Avoid or Use As Needed then, you are a Dynamic Learner. You take in the world around you differently than those whose Patterns make them Bridge or Strong-willed learners (Dawkins et al., 2010; Johnston, 2009).

A.8.6.2 Bridge Learner

If you avoid neither Patterns nor use any at a Use First level, than you are a Bridge Learner. You learn from listening to others and interacting with them. You feel comfortable using all of the Patterns. Sometimes you feel like a "jack of all trades and master of none", but you also find you can blend in, pitch in, and help make things happen as a contributing member of the group. You weigh things in the balance before you act. You lead from the middle by encouraging others rather than taking charge of the situation (Dawkins et al., 2010; Johnston, 2009).

A.8.6.3 Strong-willed Learner

If you use three or more Patterns at the Use First Level, you are a strong-willed learner. You are your own team. You prefer to work alone so that you can control the plan, the ideas, the talks, the decisions, the process and the outcomes. At times others may find it hard to follow your lead. (Dawkins et al, 2010; Johnston, 2009) (see Figure A.8)

Instead of categorising learners as we find in most learning styles inventories, the different pattern combinations makes both the learner and the teacher aware of how they process information and consequently how they learn. As Johnston (2010:51) states “the point here is your Patterns do not work in isolation nor do they provide you with a single label or identity...Your patterns, therefore acting in concert with each other, create a wholeness, a dynamic for success.” The terms ‘dynamic’, ‘bridge’ and ‘strong-willed’ learners are not there to compartmentalise learners but on the contrary they are there to help learners and teachers come to awareness where the strengths and weaknesses as a learner lie so that together they can negotiate strategies intentionally to improve on their success in learning. In this way, teacher and learner can both understand each other better and therefore communication and interaction is enhanced. Another aspect which makes LML stand out as a learning system and which differentiates it from other learning styles is the fact that it not only includes a comprehensive lexicon of terms but it also provides strategies and tools that will help both teacher and student to identify how students respond to a particular learning task and provide a way to make learning work. These strategies and tools will be discussed in detail in the following paragraphs.

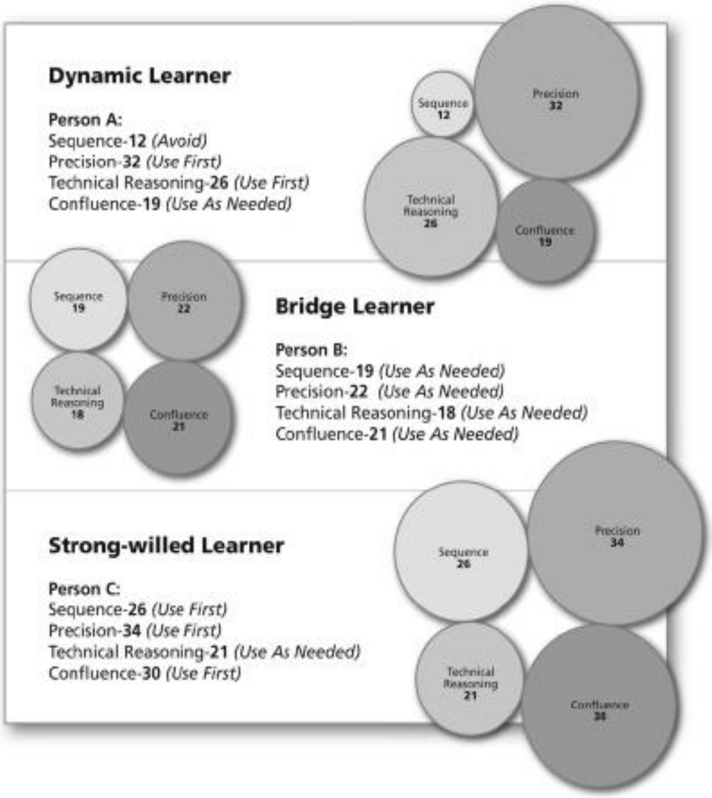


Figure A.8: Dynamic, Bridge and Strong-willed Pattern Combinations (Dawkins et al., 2010; Johnston, 2009)

A.9 Using the Let Me Learn Strategy Card for successful and meaningful learning.

The Let Me Learn Strategy Card (see Figure A.11) is an immediate, effective powerful and useful tool. It is beneficial for the learner to stay on task and accomplish successfully a specific learning assignment. It summarises into one instrument all the necessary mastered Let Me Learn skills and tools:

a. ***The Learner's Profile***: this is a description of the learner's personal use of the patterns.
b. ***The decoding of the task's instructions***: with the knowledge of the learning patterns, a learner examines the instructions given for a particular task and decodes which learning patterns are required for the successful completion of the task. In other words "what Learning Pattern(s) does the task acquire you to use to get it done effectively?" and more specifically "what pattern(s) in what ranges this task asks you to use?" Students enjoy breaking the "code" of assignments because they know that by doing so they will tackle the task with greater success and less frustration and wasted energy. To facilitate this process, the learner may refer to a Word Wall. The Word Wall, as displayed in the Figure A.9, consists of words organised under

each pattern designation which prompt students to the primary Learning Pattern(s) essential for the specific task. This tool facilitates rapid and relevant task analysis (Dawkins et al., 2010; Johnston, 2009).

Sequence Cue Words		**Precise Cue Words**	
alphabetize	order	accurately	explain
arrange	organize	calibrate	facts
classify	outline	certainty	identify
develop	plan	describe	label
distribute	put in order	detail	measure
group	sequence	document	observe
in a series	show a sample	exact	specific
list	show an array	examine	write
Technical Cue Words		**Confluent Cue Words**	
assemble	erect	brainstorm	improvise
combat engineer	experience	carefree	incredible
build	figure out	create	independence
concrete	graphically represent	different	invent
construct	just do it	dream-up	risk
demonstrate	visualize	far fetched	take a chance
draw	problem-solve	ideas	unique
engineer	tools	imagine	unusual

Figure A.9: Word Wall (Dawkins et al., 2010; Johnston, 2009)

Here it is important to mention that Let Me Learn reveals that this process of decoding and relating to one’s own learning patterns while engaged in a specific learning task is carried out through a Metacognitive Process (Johnston, 2009). This is the one major feature which makes Let Me Learn a truly advanced learning system since once you know your combination of learning processes, you can begin to use your processes with intention.

Metacognition in the LML lexicon is defined as our internal chatter (see Table A.9 and Figure A.10) or the ‘voices’ of our Patterns talking, arguing, negotiating how to proceed, how to achieve-how to reach our learning goal and succeed. A broad description of internal or self-talk, including Pattern associated talk has already been presented indirectly in the details of Figures A1 to A8. The kind of talk in these figures goes on in learners all the time, but it is often unrecognised. LML helps learners tune in directly to this chatter within them and formulate strategies to use their Patterns with intention.

Mull	Connect	Rehearse	Express	Assess	Reflect	Revisit
"Sit in the middle" of the assign-ment and consider what you want to do in response to it.	Grasp the purpose of the task and have it "click" so you can move forward.	Practice your until you feel comfort-able presenting it publically.	Share your final product and be prepared to receive public feedback.	Weigh in the balance the expecta-tions for the task versus your perfor-mance.	Face yourself by looking in the mirror and asking, What did I do or not do that made this a success or failure?"	When you go back to make corrections.

Table A.9: The seven verbs used to describe the phases in the Metacognitive Process (Dawkins et al., 2010; Johnston, 2009)

The Let Me Learn Metacognitive Process consists of a series of phases through which learners move as they seek to make sense of and respond to a specific learning task. These phases are summarised in Table A.9.

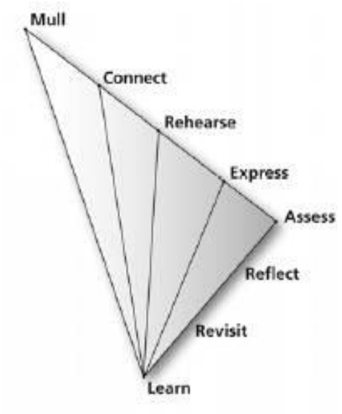


Figure A.10: The Metacognitive Drill (Dawkins et al., 2010; Johnston, 2009)

Teachers often demonstrate the phases using what is called the Metacognitive Drill, a step-by-step practice of the Metacognitive Process (see Figure A.10). An awareness of how different learners are responding to a given assignment/task and having the terms to explain progress or lack thereof in non-pejorative terms can enhance both the learning environment and the teacher's ability to respond and intervene appropriately (Johnston, 2010).

c. ***The "FIT" tools***.

The acronym, FIT, represents the three verbs forge, intensify, and tether. The final part of the Strategy Card will guide the learner to adjust to a particular learning task. What follows is an explanation of how each of the "FIT" tools can help the learner to adjust.

- ✓ *Forge*: requires learners to increase the use of their Avoid level of a specific Learning Pattern in order to succeed in completing a specific task. A learner can Forge the use of a Pattern by as much as five points on the LCI scale for a limited period of time. Forging requires intention, strategies and focused energy.

- ✓ *Intensify*: requires learners to apply their Use As Needed Pattern(s) more forcefully. A learner can intensify use of a Pattern by as much as five points on the LCI scale for a limited period of time. Intensifying requires intention, strategies and focused energy.

- ✓ *Tether*: requires learners to restrain their use of a Use First Learning Pattern. This is done by pulling back and limiting the use of a Pattern that would otherwise mislead or dominate the learner's ability to redirect effort to meet the task at hand.

(Dawkins et al., 2010; Johnston, 2009)

	SEQUENCE	PRECISION	TECHNICAL REASONING	CONFLUENCE
Your LCI Scores				
Your Own Description of Your Learning Patterns:				
How do you 'naturally' use each of your Learning Processes? (Look at your Personal Learning Profile for the descriptions asked for here)				
Your Analysis of the Learning Patterns Needed to Complete the Task (See the Decoded Task Directions):				
What does the assigned task require each of your Learning Processes to do? (Look at the decoded task and determine each Pattern being required.)				
Your Strategies for Using Your Learning Patterns Most Effectively:				
How can you Forge, Intensify, or Tether your Learning Processes to complete the task successfully?				

Figure A.11: The Let Me Learn Strategy Card (Dawkins et al, 2010; Johnston, 2009)

A.10 The Let Me Learn Process as a Metacognitive tool towards Meta-learning.

From the information given in this Appendix, it is apparent that Let Me Learn is a metacognitively driven process which empowers the learner to embark on a meta-learning journey.

In the previous pages we have described how the Let Me Learn process helps learners take responsibility for making learning work for them by using carefully developed activities including a student-designed metacognitively driven strategy card that guides the learners through various types of learning tasks. In this way, all learners are geared to be accountable for their learning outcomes by going through a Metacognitive Process. In Chapter Two we discussed how metacognition is an intrapersonal communication and Johnston refers to this 'voice' as the "internal chatter". Therefore, one may also conclude that by going through the Let Me Learn process, by being aware of how one learns and learning to adjust to new learning tasks and situations, one would be encouraged to embark upon a meta-learning journey and as a result, one would be equipped with a life-long learning skill. From the thorough explanation given on the Let Me Learn process one can easily conclude that the two components apparent in the definition of meta-learning (see Chapter Two) are also the primary features in the Let Me Learn process and so one may presume that the Let Me Learn process is also a tool which facilitates meta-learning.

A.11 Discerning the difference among learning patterns, learning styles and multiple intelligences.

As previously discussed, the theoretical basis of the Let Me Learn Process is the Interactive Learning Model (ILM) (Johnston, 1994). The Interactive Learning Model is based upon research conducted in cognitive science, brain science and multiple intelligences. The primary sources cited by Johnston as influencing and informing the development of ILM include Philip, 1936; Allport, 1961; MacLean, 1978; Pay, 1981; Gardner, 1983; Keefe & Farrell, 1990; Snow & Jackson, 1992; Perkins, 1993; Sternberg, 1996; and Bruer, 1997.

However, what follows is a discussion of how Let Me Learn built on earlier research explanations of how learning occurs, expanded them, developed personal tools while creating and using an intentional lexicon of terms that anyone from age 5 – 50 can understand. Furthermore, this lexicon of terms is integrated within a process which allows for intentional and powerful intrapersonal and interpersonal communication so that both the teacher and the learner can identify how to effectively reach a specific learning goal.

For more than half a century we have been led to categorise learners according to their preferred way of learning (Coffield et al., 2004; Sharp et al., 2008). One of the most well-known learning styles model presents learners as visual, auditory or kinaesthetic. Yet, Johnston explains *that "*all learners are each of these because all learners use the same portals to receive stimuli to the brain: the five senses of sight, sound, taste, touch and smell. And only if a learner is sensory impaired (deaf, blind, etc.) is the learner limited to a combination of the remaining operative senses." (Dawkins et al., 2010:27)

While psychological research provided us with ample research appropriate to teaching and learning, we know much less about how the brain functions and learns (Bruer, 1993; 1997). Yet, brain-based theories suggest that the brain is divided into two different sides: right brain and left brain, and each of these sides controls two different modes of thinking (Healy, 1994; Restak, 1995; Carter, 1999; McCrone, 1999). Here again we started categorising learners as either left brain or right brain. This in turn might explain why certain people are good at one thing more than the other. In actual fact, one might ask if there's a battle going on inside our heads as these two halves fight for control. Bruer, 1997 argues that these ideas "are often based on misconceptions and overgeneralisations of what we know about the brain" (Bruer, 1997:4). Healy (1994:121) shows us that "children are whole-brained learners and the brain prefers cooperation to conflict."

Howard Gardner's Multiple Intelligence theory (Gardner, 1983) showed us that there are at least, seven different ways to demonstrate intellectual ability: linguistic, intrapersonal, interpersonal, logical-mathematical, bodily-kinesthetic, spatial and musical. In the recent years, Gardner has added naturalist, spiritual-existential and moral intelligence to the list. Multiple Intelligence theory, in a nutshell, is a pluralized way of understanding the intellect. While Gardner contends that all humans have some degree of all 7 – 10 intelligences, there are those who are more gifted in some areas or in combinations of areas. Let Me Learn views Multiple Intelligences "as the inheritance of talents which we receive as part of our genetic make-up" (Dawkins et al., 2010:28) Although these intelligences are gifts that make us unique and are central to our human potential, however they are not a framework for learning. Let Me Learn suggests that these intelligences "do not determine how our brain functions nor how our mind takes in stimuli and processes the world. They are, in fact, an enhancement to our generic humanness…They are not, however a learning tool. They are a gift that enhances our humanity. Each is a kernel to be developed and nurtured." (Dawkins et al., 2010:28)

At this point I find it crucial to emphasise the fact that Let Me Learn is different from any other kind of learning style test. The primary reason for this is that unlike Let Me Learn, learning styles theory have only a slight theoretical background linked to learning constructs. In reality, learning styles emanated from the popular Myers-Briggs Personality Inventory which has Carl Jung's psychological base of personality constructs (Johnston,2009) "However, since it was not built on the basis of learning constructs, it is not a valid means for identifying how learning occurs within individuals" (Dawkins et al., 2010:29) The Let Me Learn Process is based on the assumption that taking control of how to make learning work is a powerful and positive learning experience (Flavell, 2000). So, unlike measures of learning styles, the Let Me Learn provides a lexicon of learning terms and teaches metacognitive skills to be used with intention (Osterman & Kottkamp, 2004; Johnston, 1998).

Finally, I would like to add that through my personal and professional experience, of over more than fifteen years, using the Let Me Learn Process, I observed that what has truly set this system above all other systems I came across is the fact that the difference in growth of learners and teachers alike who were involved in this process, as opposed to those children and teachers who were not, could be measured. What makes Let Me Learn different is that its use does make a measurable difference (Johnston & Johnston, 1998; Vanhear & Borg, 2000; Pearl, 2003; McSweeney, 2005; Dunham, 2006; Kocher, 2007, Cela, 2008; Dawkins, 2008; Ward, 2009).

APPENDIX B

B.1 CRITERIA FOR THE SELECTION OF THE INTERVIEWEES FOR THE SEMI-STRUCTURED INTERVIEWS.

In Chapter Three I explained that I opted for an online inventory to select the interviewees according to their responses in order to answer or be in a better position to address the secondary research question and at the same time overcome personal bias in the selection process. The online inventory allowed the participants to decide whether they were willing to participate in a follow-up interview. Only 16 out of 35 participants who completed the online inventory agreed to be interviewed (see Chapter Three for further details).

From these 16 participants, all scored higher in the deep approach than in the surface approach. Some of the participants had a slight difference in the scores between the surface and deep approach, while others had a big difference meaning that their approach mainly focuses on the deeper side of teaching and learning rather than on the surface approach. For the purpose of this part of the research, there were some participants who scored high in the Affective items meaning that in one way or another they took the affective factors into consideration while others who scored very low meant that either they gave less importance to affective factors or they overshadowed them. Consequently, to delve deeper, I selected five participants whose scores are depicted as 'outliers' (see Chapter Three) while one was selected since his scores lay in the average range (see Figure B.1).

Participant 2 scored higher in the deep approach than in the surface approach. This means that he goes for a deep approach towards learning and teaching. However, I selected this participant since he had the lowest score in the deep approach. His score is the 'outlier' within the deep approach.

Participant 3 scored higher in the deep approach than in the surface approach. This means that he goes for a deep approach towards learning and teaching. I selected this participant since although he has one of the largest difference in scores between the deep and the surface approach, yet he had the lowest score in the Affective items. Therefore his score is the 'outlier' in the Affective items.

		ITEM No.	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6	Participant 7	Participant 8	Participant 9	Participant 10	Participant 11	Participant 12	Participant 13	Participant 14	Participant 15	Participant 16
CCSF - Conceptual Change Student Focused	INTENTION	6	3	4	5	4	4	5	5	4	5	4	5	4	5	5	5	5
		11	5	4	5	5	5	4	5	5	4	5	5	5	4	5	4	5
		22	5	4	5	4	3	5	5	5	4	4	5	4	4	5	4	5
		23	5	4	5	3	5	3	4	4	4	4	3	5	3	5	5	5
			18	16	20	16	17	17	19	18	17	17	18	18	16	20	18	20
	STRATEGY	3	5	4	5	5	4	5	5	5	5	4	5	4	5	5	5	5
		8	3	3	5	4	4	3	2	5	3	2	5	4	4	5	2	5
		12	2	3	4	4	4	4	4	4	4	3	4	4	4	4	4	5
		20	1	2	3	4	3	4	3	5	4	3	3	4	4	5	2	4
			11	12	17	17	15	16	14	19	16	12	17	16	17	19	13	19
DEEP			29	28	37	33	32	33	33	37	33	29	35	34	33	39	31	39
ITTF - Information Transmission Teacher Focused	INTENTION	2	5	4	5	4	4	5	3	2	3	2	4	3	1	5	4	3
		5	3	2	1	5	3	4	4	2	2	4	5	2	1	4	2	3
		15	1	2	1	3	2	2	3	1	2	2	1	2	3	1	1	2
		18	2	3	1	5	1	2	5	4	2	3	1	4	4	1	4	3
			11	11	8	17	10	13	15	9	9	11	11	11	9	11	11	11
	STRATEGY	1	4	3	5	5	3	3	3	2	2	3	4	3	4	3	3	2
		9	3	2	1	2	4	3	4	1	2	3	2	2	4	2	2	3
		14	1	4	1	3	4	4	4	2	3	2	3	4	5	3	2	3
		17	1	1	1	3	1	2	2	1	1	1	1	1	5	1	1	2
			9	10	8	13	12	12	13	6	8	9	10	10	18	9	8	10
SURFACE			20	21	16	30	22	25	28	15	17	20	21	21	27	20	19	21
AFFECTIVE FACTORS	INTENTION	4	5	3	1	1	4	5	5	5	3	4	5	3	3	4	4	5
		10	4	3	1	3	4	4	3	4	3	3	5	3	5	5	4	5
		16	1	2	1	3	2	3	4	1	2	2	4	1	3	1	2	3
		24	4	4	3	5	5	5	4	5	5	4	5	4	4	5	3	4
			14	12	6	12	15	17	16	15	13	13	19	11	15	15	13	17
	STRATEGY	7	1	3	3	4	5	3	1	4	2	3	3	3	3	3	3	5
		13	4	5	4	5	4	4	5	5	5	4	5	4	4	5	3	4
		19	1	3	4	3	1	3	1	2	2	2	4	1	3	3	2	4
		21	5	3	1	3	5	2	3	4	4	3	5	1	4	3	4	4
			11	14	12	15	15	12	10	15	13	12	17	9	14	14	12	17
AFFECTIVE			29	26	18	27	30	29	26	30	26	25	36	20	29	29	25	34

Figure B.1: Online inventory's raw scores of participants who accepted a follow-up interview.

Participant 4 scored higher in the deep approach than in the surface approach however, there was the slightest difference in the scores between the deep and the surface approach. His score in the Affective items scored lower than the surface approach where the trend was that scores in the Affective items were higher than the scores in the surface approach.

Participant 8 scored higher in the deep approach than in the surface approach depicting that he tends to go more often to a deep approach in teaching and learning. There was the biggest difference in the scores between the deep and the surface approach while he had one of the highest scores in the Affective items.

Participant 11 scored higher in the deep approach than in the surface approach. This means that he goes for the deep approach in teaching and learning. However, this participant's affective score maybe considered as an outlier since he had the highest score in the affective items.

Participant 9 scored higher in the deep approach than in the surface approach. This means that he goes for the deep approach in teaching and learning. However, the difference in scores between the surface and deep approach lies within the average range and his score in the affective items also lies in the average range.

APPENDIX C

C.1 ONLINE INVENTORY

Subscales in the online inventory as administered in the second phase of this research. The items under the grey shaded subscale are the items presented in the ATI by Prosser and Trigwell, (1999), while the items under the yellow shaded subscale are the added items around affective factors which were added to serve the purpose of this study.

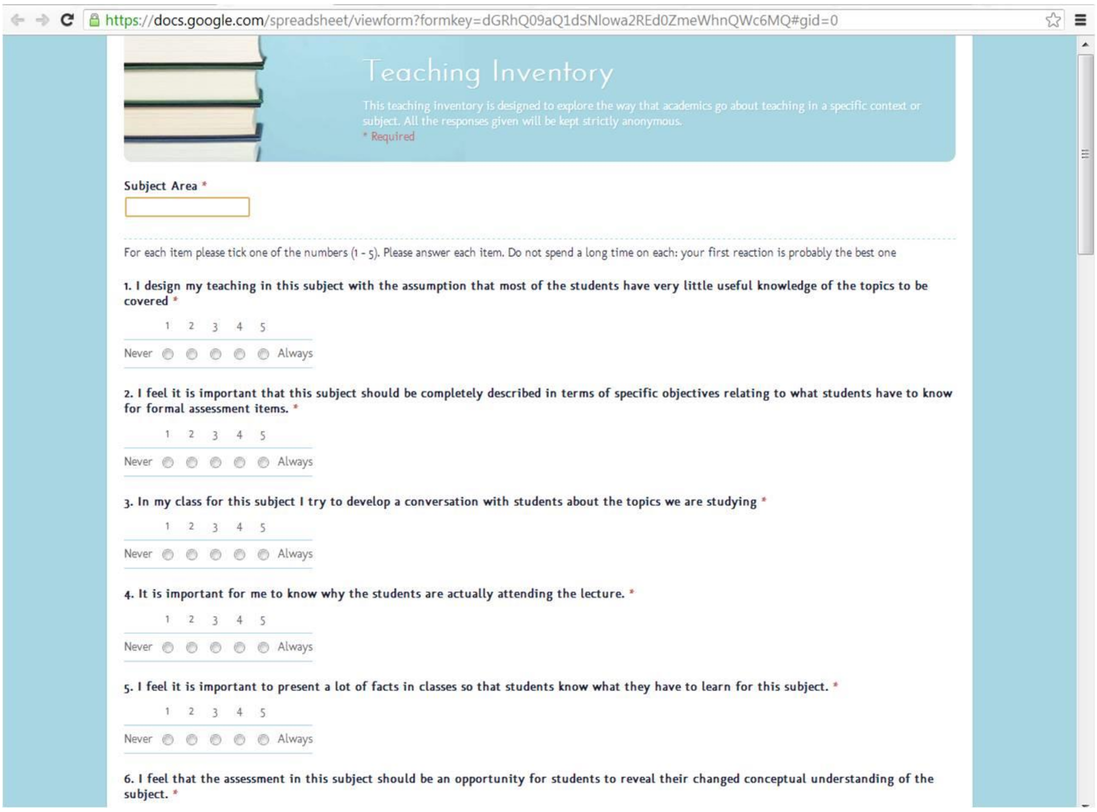
Sub-scale: Conceptual change/student-focused (CCSF) approach	
Intention items	Item no.
I feel that the assessment in this subject should be an opportunity for students to reveal their changed conceptual understanding of the subject.	6
I encourage students to restructure their existing knowledge in terms of the new way of thinking about the subject that they will develop.	11
I feel that it is better for students in this subject to generate their own notes rather than always copy mine.	22
I feel a lot of teaching time in this subject should be used to question students' ideas.	23
Strategy items	Item no.
In my class for this subject I try to develop a conversation with students about the topics we are studying.	3
We take time out in classes so that the students can discuss, among themselves, the difficulties that they encounter studying this subject.	8
In lectures for this subject, I use difficult or undefined examples to provoke debate.	12
Formal teaching time is made available in this subject for students to discuss their changing understanding of the subject.	20
Sub-scale: Information transmission/teacher focused (ITTF) approach	
Intention items	Item no.
I feel it is important that this subject should be completely described in terms of specific objectives relating to what students have to know for formal assessment items.	2
I feel it is important to present a lot of facts in classes so that students know what they have to learn for this subject.	5
I think an important reason for giving lectures in this subject is to give students a good set of notes.	15

I feel that I should know the answers to any questions that students may put to me during this subject.	18
Strategy items	Item no.
I design my teaching in this subject with the assumption that most of the students have very little useful knowledge of the topics to be covered.	1
In this subject I concentrate on covering the information that might be available from a good textbook.	9
I structure this subject to help students to pass the formal assessment.	14
When I give this subject, I only provide the students with the information they will need to pass the formal assessments.	17
Sub-scale: Focusing on affectation – teacher/student approach	
Intention items	Item no.
It is important for me to know why the students are actually attending the lecture.	4
I encourage the students to tell me why it is important for them to learn more about this subject.	10
I give importance to the fact that students attend the lecture whether they like it or not.	16
I give importance to see how the students' interest in this subject is developing throughout the lectures	24
Strategy items	Item no.
I check with the students how they prefer to learn (through hands on, through detailed information, through clear step by step instructions, through creativity & new ideas) in order to adapt my teaching methods accordingly so that students are comfortable.	7
During the lectures I make use of different pedagogical tools and different instructional techniques to reach different students.	13
I like to ask for a written reflection at the end of the lectures to see the development of the students' interest in this subject	19
When I start the lectures for this subject I specifically ask the students why it is important for them to know more about this subject.	21

Figure C.1: Subscales in the online inventory

APPENDIX D

D.1 SCREEN SHOT OF ONLINE INVENTORY


https://docs.google.com/spreadsheet/viewform?formkey=dGRhQ09aQ1dSNlowa2REd0ZmeWhnQWc6MQ#gid=0

Teaching Inventory

This teaching inventory is designed to explore the way that academics go about teaching in a specific context or subject. All the responses given will be kept strictly anonymous.

* Required

Subject Area *

For each item please tick one of the numbers (1 - 5). Please answer each item. Do not spend a long time on each: your first reaction is probably the best one

1. I design my teaching in this subject with the assumption that most of the students have very little useful knowledge of the topics to be covered *

1 2 3 4 5

Never Always

2. I feel it is important that this subject should be completely described in terms of specific objectives relating to what students have to know for formal assessment items. *

1 2 3 4 5

Never Always

3. In my class for this subject I try to develop a conversation with students about the topics we are studying *

1 2 3 4 5

Never Always

4. It is important for me to know why the students are actually attending the lecture. *

1 2 3 4 5

Never Always

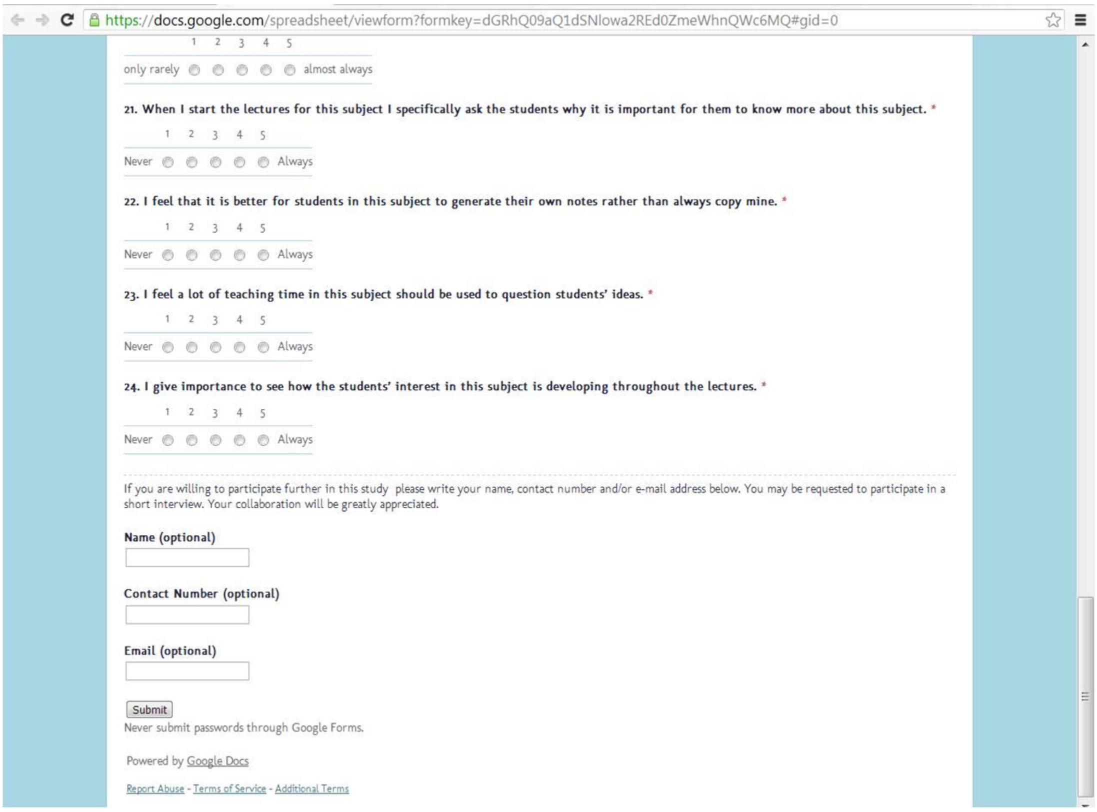
5. I feel it is important to present a lot of facts in classes so that students know what they have to learn for this subject. *

1 2 3 4 5

Never Always

6. I feel that the assessment in this subject should be an opportunity for students to reveal their changed conceptual understanding of the subject. *

Figure D.1: The statements of the inventory were converted into a web-based self-completion inventory using a basic Google Form.



https://docs.google.com/spreadsheet/viewform?formkey=dGRhQ09aQ1dSNlowa2REd0ZmeWhnQWc6MQ#gid=0

1 2 3 4 5

only rarely ○ ○ ○ ○ ○ almost always

21. When I start the lectures for this subject I specifically ask the students why it is important for them to know more about this subject. *

1 2 3 4 5

Never ○ ○ ○ ○ ○ Always

22. I feel that it is better for students in this subject to generate their own notes rather than always copy mine. *

1 2 3 4 5

Never ○ ○ ○ ○ ○ Always

23. I feel a lot of teaching time in this subject should be used to question students' ideas. *

1 2 3 4 5

Never ○ ○ ○ ○ ○ Always

24. I give importance to see how the students' interest in this subject is developing throughout the lectures. *

1 2 3 4 5

Never ○ ○ ○ ○ ○ Always

If you are willing to participate further in this study please write your name, contact number and/or e-mail address below. You may be requested to participate in a short interview. Your collaboration will be greatly appreciated.

Name (optional)

Contact Number (optional)

Email (optional)

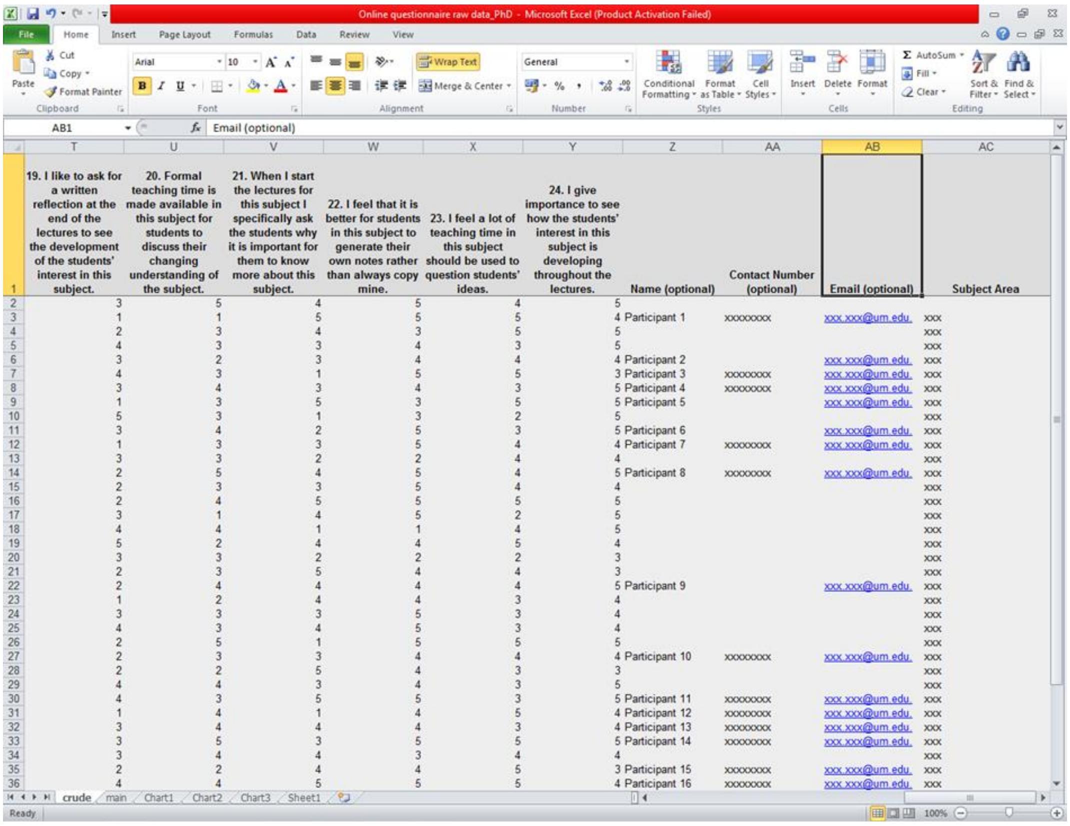
Submit

Never submit passwords through Google Forms.

Powered by Google Docs

Report Abuse - Terms of Service - Additional Terms

Figure D.2: Personal information was requested at the end but this was optional



Online questionnaire raw data_PhD - Microsoft Excel (Product Activation Failed)

AB1 Email (optional)

	T	U	V	W	X	Y	Z	AA	AB	AC
1	19. I like to ask for a written reflection at the end of the lectures to see the development of the students' interest in this subject.	20. Formal teaching time is made available in this subject for students to discuss their changing understanding of the subject.	21. When I start the lectures for this subject I specifically ask the students why it is important for them to know more about this subject.	22. I feel that it is better for students in this subject to generate their own notes rather than always copy mine.	23. I feel a lot of teaching time in this subject should be used to question students' ideas.	24. I give importance to see how the students' interest in this subject is developing throughout the lectures.	Name (optional)	Contact Number (optional)	Email (optional)	Subject Area
2	3	5	4	5	4	5				
3	1	1	5	5	5	4	Participant 1	xxxxxxxx	xxx.xxx@um.edu.	xxx
4	2	3	4	3	5	5				xxx
5	4	3	3	4	3	5				xxx
6	3	2	3	4	4	4	Participant 2		xxx.xxx@um.edu.	xxx
7	4	3	1	5	5	3	Participant 3	xxxxxxxx	xxx.xxx@um.edu.	xxx
8	3	4	3	4	3	5	Participant 4	xxxxxxxx	xxx.xxx@um.edu.	xxx
9	1	3	5	3	5	5	Participant 5		xxx.xxx@um.edu.	xxx
10	5	3	1	3	2	5				xxx
11	3	4	2	5	3	5	Participant 6		xxx.xxx@um.edu.	xxx
12	1	3	3	5	4	4	Participant 7	xxxxxxxx	xxx.xxx@um.edu.	xxx
13	3	3	2	2	4	4				xxx
14	2	5	4	5	4	5	Participant 8	xxxxxxxx	xxx.xxx@um.edu.	xxx
15	2	3	3	5	4	4				xxx
16	2	4	5	5	5	5				xxx
17	3	1	4	5	2	5				xxx
18	4	4	1	1	4	5				xxx
19	5	2	4	4	5	4				xxx
20	3	3	2	2	2	3				xxx
21	2	3	5	4	4	3				xxx
22	2	4	4	4	4	5	Participant 9		xxx.xxx@um.edu.	xxx
23	1	2	4	4	3	4				xxx
24	3	3	3	5	3	4				xxx
25	4	3	4	5	3	4				xxx
26	2	5	1	5	5	5				xxx
27	2	3	3	4	4	4	Participant 10	xxxxxxxx	xxx.xxx@um.edu.	xxx
28	2	2	5	4	3	3				xxx
29	4	4	3	4	3	5				xxx
30	4	3	5	5	3	5	Participant 11	xxxxxxxx	xxx.xxx@um.edu.	xxx
31	1	4	1	4	5	4	Participant 12	xxxxxxxx	xxx.xxx@um.edu.	xxx
32	3	4	4	4	3	4	Participant 13	xxxxxxxx	xxx.xxx@um.edu.	xxx
33	3	5	3	5	5	5	Participant 14	xxxxxxxx	xxx.xxx@um.edu.	xxx
34	3	4	4	3	4	4				xxx
35	2	2	4	4	5	3	Participant 15	xxxxxxxx	xxx.xxx@um.edu.	xxx
36	4	4	5	5	5	4	Participant 16	xxxxxxxx	xxx.xxx@um.edu.	xxx

crude / main / Chart1 / Chart2 / Chart3 / Sheet1

Figure D.3: The responses submitted in the inventory were automatically entered into an excel data sheet.

APPENDIX E

E.1 A sample of the e-mail sent to full time lecturers as a covering letter with online inventory.

Move to Inbox | More

Jacqueline Vanhear <jacvan@gmail.com> 03/02/2013
to

Dear Prof

My name is Jacqueline Vanhear and I am currently reading for a PhD at King's College, London, focusing on the use of Concept Mapping within Higher Education. Apart from working with Concept Maps with students, a small part of my research will entail exploring how different academics approach teaching and learning in different contexts.

Consequently, I would be very grateful if you took a couple of minutes to fill in this SHORT online inventory. The responses will be kept strictly anonymous. At the end of the online inventory you will be given the option whether you would like to participate further or not in a short interview should the need arise.

Please access the online inventory by clicking here. Your collaboration will be appreciated. Please submit the inventory by **THURSDAY, 14th February 2013**.

Kind regards and thank you for your time.

...

Jacqueline Vanhear <jacvan@gmail.com> 13/02/2013
to

Dear Prof

I am sending this e-mail as a reminder with regards to the e-mail below where I am asking you to fill in an online Teaching and Learning Inventory as part of my PhD research.

If you have already submitted your responses, please ignore this e-mail and I would like to take this opportunity to sincerely thank you for your participation.

If you have not yet submitted your responses, I would like to kindly ask you to access the online inventory by clicking here. The deadline for submission is tomorrow, Thursday, 14th February 2013.

Thank you for your time

Kind regards

...

14/02/2013
to me

Done it.

Prof

...

APPENDIX F

F.1 The structure of the semi-structured interview

Thank you for being willing to take part in a follow-up interview to the previous online questionnaire. I would like to assure you that you will remain completely anonymous and no records of the interview will be kept with your name on them.

1. How long have you been a lecturer within the Faculty of Education?
   Probes: Full time/ part-time
2. What subject context do you lecture?
   Probes: do you run tutorials or seminars?
3. During your lecture what would be your main learning outcome or outcomes?
   Probes: are these learning outcomes given to you or have you constructed them?
4. What would you do in order to meet your learning outcome/s?
5. What aspects of the learning process do you give importance to in order for students to achieve your learning outcome(s)?
6. From the online questionnaire it was evident that most lecturers within the Faculty go for a deep approach to teaching and learning. What would you recommend to lecturers within Higher Education so as to improve on their practice?
   Probes: what do you understand by deep approach? How is this manifested?
7. Have you heard of Concept Maps? 7b. What are your thoughts about them?
   Probes: Too time-consuming? Students don't like them, they want the answers? do you blame students, curriculum, colleagues for under-use of them?
8. Would you be willing to use them in your lectures? *How? Why?*

I would like to sincerely thank you for your time and collaboration

APPENDIX G

G.1 Consent Form for Students

Merging Metacognitive Tools for use in Higher Education to Facilitate Meaningful Learning.

Please tick (✔) in the box on the right if you agree

1. I confirm that I have been debriefed and understood my participation in the above research. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason by sending an email on **jacvan@gmail.com** ☐

3. I am aware that I can ask questions when I feel the need to. ☐

4. I understand that my name will stay anonymous throughout the research or in any published articles. ☐

5. I give permission to the researcher to use and/or publish anonymously my work products. ☐

6. Neither my name nor any other identifying information will be used in conclusions resulting from the study. ☐

7. I understand that my personal information will be looked at only by the researcher and her supervisory team. ☐

Name of Student	Signature	Date

APPENDIX H

H.1 Permission from the University of Malta to conduct the online inventory

Jacqueline Vanhear <jacvan@gmail.com> 21/11/2012
to comms

Dear Ms.

I am at the moment carrying out a Doctoral Research with CEER (Centre for Environmental Education and Research). Part of this research will entail a short interview with a number of lecturers within the Faculty of Education. In order to identify prospective participants for this interview I intend to circulate among lecturers an online inventory.

Would you please guide me as to how I can go about this part of my research? Would you be able to supply me with e-mail addresses of lecturers within the Faculty of Education please?

I would appreciate if you would give me your feedback at your earliest convenience.

Kind regards and thank you for your time.

...

30/11/2012
to me

Dear Ms Vanhear,

I refer to our recent telephone conversation and would like to confirm that I see no objection to sending this request to those mentioned in your email as long as your supervisor is in agreement.

With best regards,

Figure H.1: Step 1 – Requesting permission from the Communications office

03/12/2012
to me

Dear Ms. Vanhear,

I will forward your request to the Office for Human Resources Management & Development as they will be able to forward you a list of full time and part time members of staff at the Faculty of Education.

Regards

...

```
---------------------

Dean, Faculty of Education
Associate Professor in Early Childhood Education

Room 233, Department of Primary Education
Faculty of Education
University of Malta
Msida, Malta

Tel:  (00-356)2340-2930
Fax:  (00-356)21419045
```

05/12/2012

Figure H.2: Step 2 – requesting permission from the Dean of the Faculty of Education

Jacqueline Vanhear <jacvan@gmail.com> 30/11/2012

to

Dear Ms.

I would like to circulate an online inventory among lecturers within the Faculty of Education as part of my doctoral research.

Would you kindly supply me with a list of full time and part time lecturers within the Faculty of Education so as to make sure that I would have sent it to all the lecturers concerned?

Kind regards

PS: here below is the communication from Ms. as per our telephone conversation.

...

Figure H.3: Step 3 – Permission from Human Resources Management and Development

05/12/2012

to me

Dear Jacqueline,

Please find list provided by HR as requested.

Regards

-------- Original Message --------
Subject: Re: Fwd: Fwd: Re: Fwd: Fwd: Doctoral Research
Date: Wed, 05 Dec 2012 12:25:26 +0100
From:
To:

Dear ,

Attached please find the requested list. Please note that there are a number of visiting staff that lack an email address; those are staff that do not have a UoM email account.

Regards,

Senior Executive - HRM&D

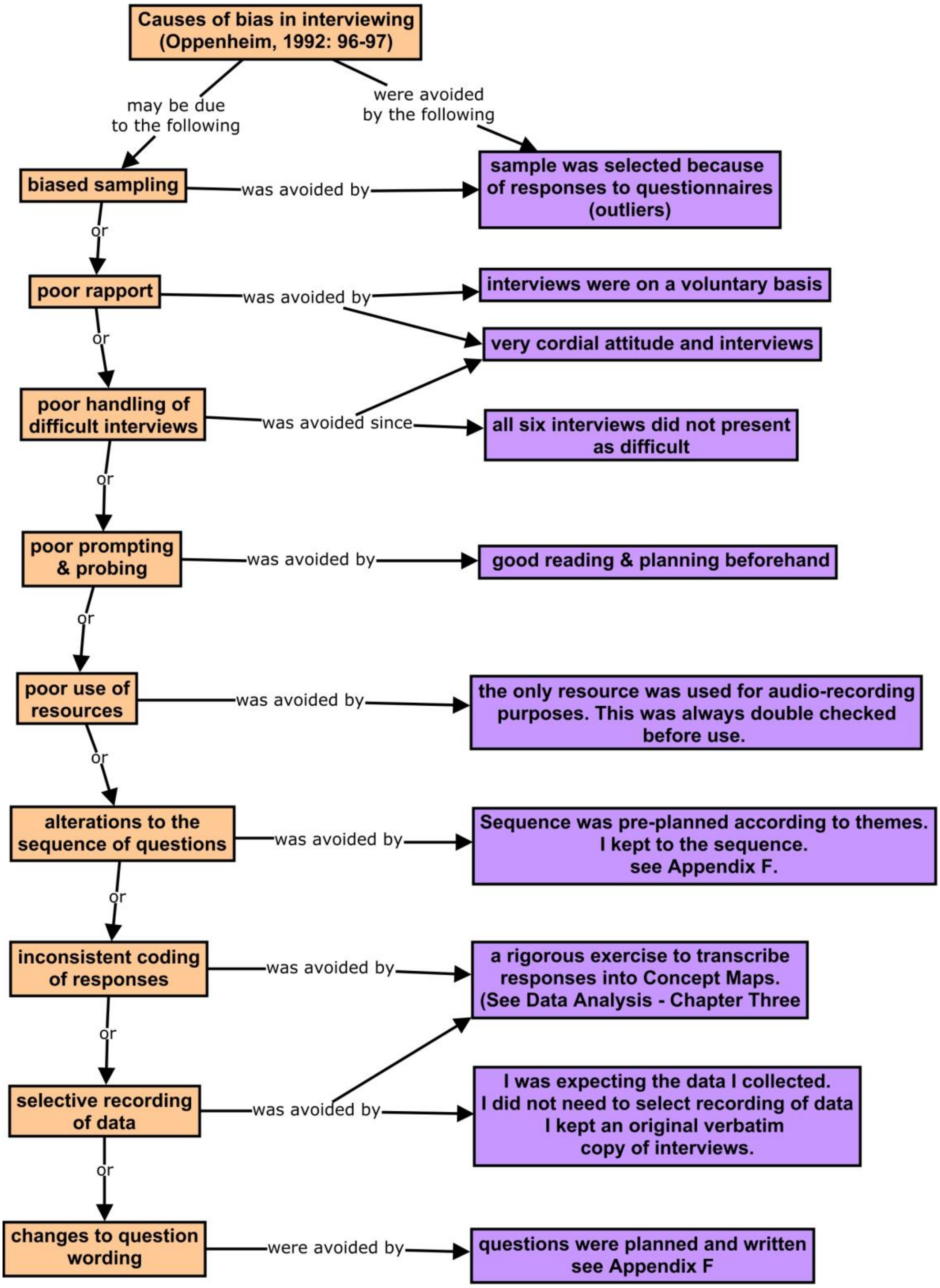
University of Malta
Tel: 2340 2630
www.um.edu.mt

Please consider your environmental responsibility before printing this e-mail.

Figure H.4: Receipt of requested list of full time lecturers email addresses

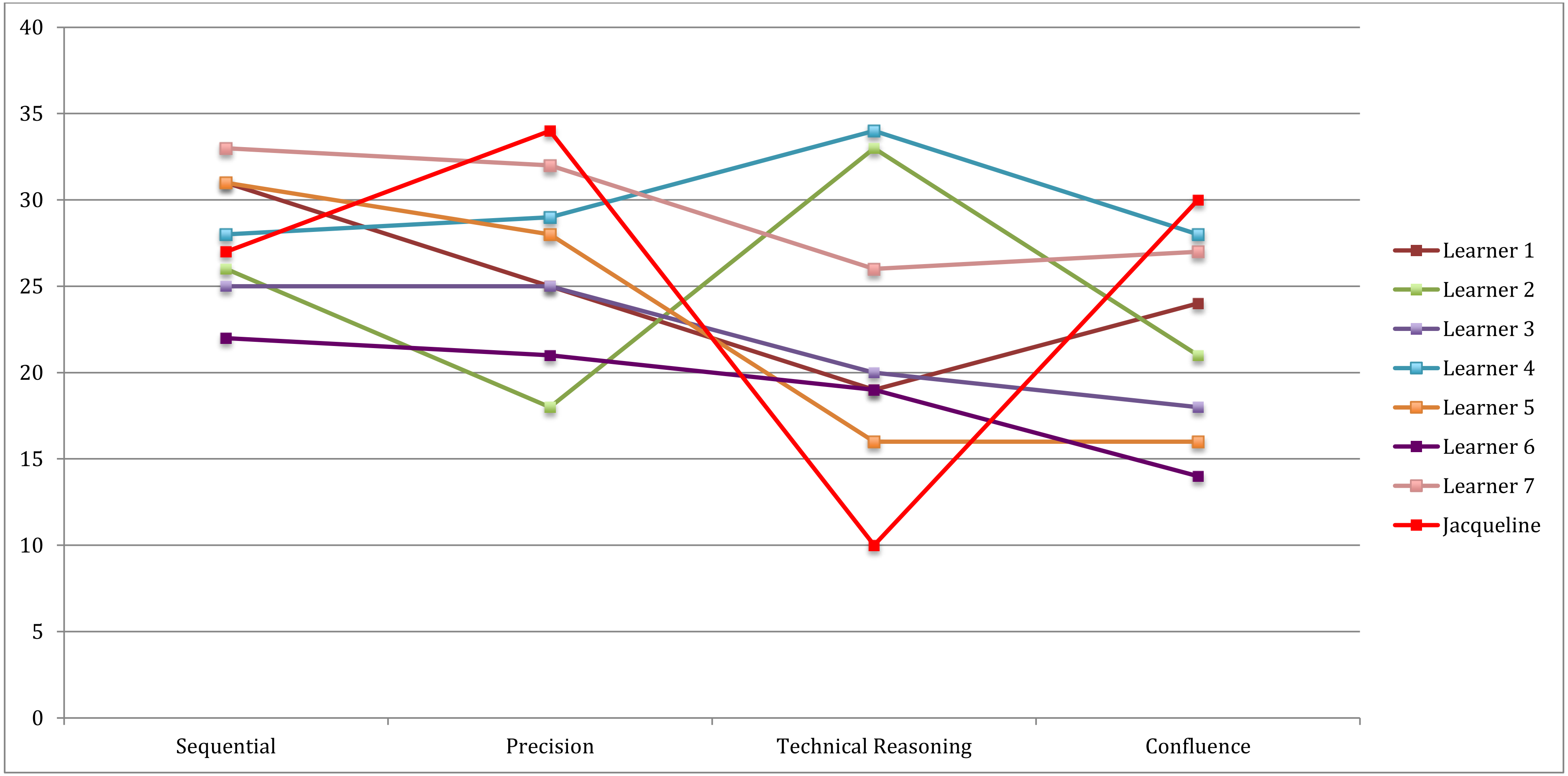
APPENDIX I

I.1 BIAS



APPENDIX J

J.1 Relationship between the lecturer's (Vanhear, J.) and the learners' learning patterns



APPENDIX K

K.1 Vanhear's learning patterns and strategy card

Figure K.1: Vanhear's Power card

Sequence	Precision	Technical	Confluence
I need to plan before I start working. I like to know exactly what is expected of me I look for examples I always present a neat and organised assignment. I panic when I don't have the time to finish a task in the way I want to finish it.	I always look up all kinds of information from many different sources. I feel better when I know that what I am doing is correct. I am annoyed at my mistakes. I find it easy to express myself in writing. I browse the internet everyday because it provides me with all the details I would be looking for.	I don't like to build or sew or make things with my hands. I am always afraid to use a new appliance because I might break it. I hate being on my own I enjoy putting to practise what I learn in books.	I always have to be different. I like to take risks. I consider life boring without any new challenges. I like meeting new people and go to new places. I am always having these ideas bubbling in my head and I feel frustrated when I cannot externalise them. I love the internet – it takes me to another world.
I plan when I have time but I don't block or panic when things don't go the way I planned them.	*Not ALL details are important. Focus on the task. Everyone makes mistakes…it's not the end of the world*	*I have to take risks also when it comes to using my hands to do things. Just wreck your brains!*	*I need to control my bubbling ideas and emotions….some people feel threatened!* *I need to be more diplomatic!*

Table K.2: Vanhear's Strategy card

APPENDIX L

L.1 Learning patterns at a glance

Precision

- I want a lot of information.
- I want time to check my work and to be sure it is correct.
- I would like time to look up more information.
- I answer questions as exactly as possible.
- I ask a lot of questions.
- I read a lot of books.
- I like lots of detail.
- I answer better in writing than speaking.

Sequence

- I want clear, step by step directions.
- I want to go over and over the directions.
- I want to see an example.
- I want time to plan.
- I want more time to do a neat, clean work.
- I would like extra time to double check my answers and make corrections.

Technical Reasoning

- I want to be left alone while working.
- I prefer to do projects instead of writing.
- I want to build things to show what I know.
- I don't want to show the teacher what I know.
- I learn better by doing.
- I learn better from real life experiences.

Confluence

- I want to get started and ask for directions later.
- I want to do work in a different way.
- I like to come up with new ideas.
- I don't like to follow lots of rules or regulations.
- I like to take risks.
- I like to talk in front of the class to show what I know.
- I like to learn in a creative way.