THE 7Ms PEDAGOGY MODEL: INSTRUCTIONAL DESIGN FOR LEARNERS WITH ATTENTION-DEFICIT HYPERACTIVITY DISORDER

Submitted in fulfillment of the requirement for the degree of Doctor of Philosophy

By
Samira Sadat Sajadi

Brunel Business School
Brunel University

June 2013

Abstract

This study presents a new framework for designing pedagogy in an informed and controlled way. It considers the importance of progression of pedagogy during a learning episode, so that an instructor can modify the pedagogical approach as well as the content in a lesson. The significance and novelty of this research lie in the proposals to provide support for ADHD learners and assist them to overcome their academic weaknesses/challenges through appropriate pedagogically sound interventions. Therefore, in order to contribute to the development of a suitable pedagogical approach for children who diagnosed with ADHD, issues of having ADHD are discussed within the scope of the research. In this respect, an aetiological model of ADHD has been developed to identify different levels of impairments as well as to clarify areas in which educational pedagogies must address the limitations of ADHD learners.

Early stage results described here consider evidence to determine the viability of two literature-based models, named the '*6Ms pedagogy model*' and the '*aetiological model of ADHD*'. In identifying the need to explore an accurate pedagogical model for ADHD children, two models have been evaluated. The analysis is based on a combination of secondary analysis, qualitative, and quantitative data analysis, which covered data, collected from expert advice, including that from professionals, coaches, and teachers and from those involved in the education of learners with ADHD and parents. Evidence from findings on ADHD is married to a new model of pedagogy named the '*7Ms pedagogy model*'. The ADHD pedagogical model is then evaluated by SEN teachers serves to facilitate well-informed and targeted design decisions about pedagogy, which could provide children with support and help them overcome academic limitations.

Keywords: Attention Deficit-Hyperactivity Disorder; 6Ms Pedagogy Model; 7Ms Pedagogy Model; learning theories; aetiological model; typically developing learners (TDLs); and special educational needs (SEN).

Dedication

This doctoral research is dedicated to all my family members for their love, prayers, and endless support.

Acknowledgement

The accomplishment of this investigation was only possible by the guidance, professional supervision, and encouragement that have been offered by my supervisor Dr. Tariq Khan. I am grateful for the devoted time, effort, constructive feedback, and thoughts and creativity provoking ideas you have honored me.

I am thankful of academic members, administrative staff, and colleagues in Brunel Business School for their support during my PhD programme.

I would like to express my appreciation to participants from schools and all professionals for accepting and taking part in this research. Finally, special thanks to my family and every person who loved to see the successful accomplishment and achievement of this work.

Table of Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

ADHD Attention Deficit Hyperactivity Disorder

ADD Attention Deficit Disorder

ASD Autism Spectrum Disorder

BDS Brain Damage Syndrome

BFIs Behavioural Family Intervention Programme

CAI Computer Assisted Instruction

CD Conduct Disorder

CLT Cognitive Load Theory

CRB Criminal Record Bureau

DSM Diagnosed and Statistical Manual of Mental Disorders

DCD Developmental Coordination Disorder

EF Executive Function

FAS Fetal Alcohol Syndrome

HRC Hyperkinetic Reaction of Childhood

ICT Information Communication Technology

LD Learning Disabilities

L1 Level One

L2 Level two

L3 Level Three

ODD Oppositional Defiant Disorder

MBD Minimal Brain dysfunction

PBD Postencephalitic Behaviour Disorder

PP Productive Pedagogy

SAS Supervisory Attentional System

SEN Special Educational Needs

SET Six Element Task

SRDD Self-Regulation Deficit Disorder

TDLs Typically Developing Learners

WM Working Memory

Declaration

I Samira Sadat Sajadi declare that this research, its idea, analysis, findings, and conclusions that are included in this PhD dissertation are entirely developed by me for the purpose of this programme only and have not been submitted for another qualification.

Chapter one: Introduction

1.1 Introduction and Background

This chapter provides an overview of the background and motivation of the current study, which is organised as follows. The chapter starts with the rationale and boundaries of the research. The significance and primary objectives of the study will also be introduced. Research questions developed from literature investigation will be presented. Finally, the chapter ends with the contributions and outlines of the study that have emerged from each chapter.

Education, naturally, plays a vital role in society around the world. Thus, a large amount of research has been conducted, with the aim of developing educational tools for typically developing learners (TDLs). However, learners with special educational needs (SEN)[1] (i.e. ADHD, autism, dyslexia, learning disabilities, etc.), which are associated with several learning difficulties, often find it difficult to learn in the same way as typical learners (MacFarlane and Woolfson, 2013). Interestingly, 'attention-deficit/hyperactivity disorder' is recognised in other cultures as well such as India, China, and Iran which has been defined as a *common developmental disorder* suffers from three core symptoms of inattention, hyperactivity, and impulsivity (Sivakumar *et al*., 2013; Wang *et al*., 2013; Saneei *et al*., 2010). It is important to note that, the word '*disorder*' is used throughout this thesis to refer to various conditions following the practice in the research and medical communities. It is recognised though that many parents and practitioners object to the attribution of disorder to a condition that they consider being an alternative normality. The author does not intend to take a position on the debate surrounding the suitability of the word 'disorder' when applied to people with the symptoms of inattention, hyperactivity and impulsivity (i.e. ADHD). Instead, the term has been adopted to ensure alignment with the prevailing literature in the research community – notably, that of Barkley (1997) and Brown (2005), who are two of the most prominent researchers in the field and have produced influential models that

[1] Terminology adopted to refer to the various forms of special needs is acknowledged to be at times contentious, however, it is the predominant language employed in the professional literature so it is employed in this thesis.

use the word disorder. The early stage classroom observations in both UK and Iran provided the starting point for researcher to take the study further. The author have found that typically developing learners (TDLs) and children with SEN are often taught in the classroom on the assumption that they are equally able to learn from the methods used for the whole class. This important point has drawn the researchers' attention in a way that we need to have a better way of designing instruction for students who have particular special needs. Currently, there are some approaches available; however, they tend to be rather simplistic, for instance, using visual techniques or repeating instructions. But this is not really a pedagogy model. What teachers need is guidance on how to support pupils with SEN (ADHD) in a controlled and continuous way for the whole session. Therefore, they need this guidance on pedagogy for how to design lessons that consider specifically the limitations associated with ADHD.

The realisation is that we cannot teach TDLs and SEN together, using the same techniques. This is because the learning process makes demands on the learners, with which ADHD children cannot cope; for instance, short-term memory, attention deficit and impulsive behavior. Therefore, some of the assumptions that teachers make about the capability of students are wrong when considering SEN pupils. Teachers might design a lesson, on which they assume that students can focus, will be well behaved and able to process and recall certain amount of information. However, these assumptions are not valid in the case of ADHD children, who will have difficulties. Therefore, we recognised the fact that, firstly, the same pedagogy for TDLs should not be used for ADHD. Secondly, the support provided in the classroom is either in the form of the teacher dealing with both types of learner or a teacher/learning assistant to sit with a SEN child and provide support.

It is important to note that teacher assistants are often not qualified and they do not have the full educational understanding. They provide support for a child to overcome their limitations. Significantly, this research does not seek to determine whether mixing SEN children with TDLs is beneficial or harmful; however, *this study suggests that problems occur when teachers try to teach SEN children using the same means of pedagogy applied to TDLs.* In this respect, the researcher is contributing to the design of a pedagogy tool that will help teachers to develop a lesson tailored specifically to the requirements of SEN children. A pedagogy tool serves as a detailed guide to best

practice for planning interventions for ADHD; also, it provides a link between pedagogy design and ADHD interventions and behaviours. It is the tool that provides a better informed means for teachers' plans to support ADHD pupils. So, when teachers are preparing lesson plans, whether specialists or a comprehensive mixed class, they can design pedagogy in a controlled way for special types of learner. Furthermore, with this model, the researcher is also ensuring that is continues, so the pedagogy can change over the course of the lesson.

The main problem this study addresses is that children who have been diagnosed with ADHD or some other kind of "disorder" often require specific educational interventions to help them learn. This fact is widely accepted as a normal part of the school system, so it is usual to see a classroom in which children with mixed abilities (and associated mixed labels, such as SEN, Gifted and Talented), are taught together. In principle, teachers are required to differentiate within the lesson to ensure that every pupil receives the best form of teaching suitable to their needs. However, this is difficult to achieve in practice because teachers are usually inexperienced with teaching SEN, and do not have specialist knowledge to guide them. The result of this situation is that the needs of many children are unmet. The purpose of this study, therefore, is to contribute to teaching practice through providing insight in to the personal views of different stakeholders involved in the teaching of SEN children, and secondly, to provide practical tools that can be used in the classroom to help teachers design and provide a more personalised learning experience for ADHD learners. These contributions are achieved through a number of different models: there are two pedagogy models: 6Ms and 7Ms, which describe the elements of a pedagogy that need to be considered by teachers when they design a specific lesson for any pupil. The difference between 6Ms and 7Ms is that the 7Ms version of the pedagogy model is amended to be applicable to pupils with ADHD – thus, 6Ms is a subset of the more comprehensive 7Ms pedagogy model. Secondly, in order to support the 7Ms model, it was necessary to develop several aetiological models of ADHD, which represent the perspective taken by different stakeholders towards the aetiology of ADHD (namely, Parents, Teachers, Coaches and Experts). These aetiological models represent the different Roles or perspectives that an educator can take during a lesson in the classroom, and so the 7^{th} M of the pedagogy model pertains to the ability of the educator to swap or change the "role" they adopt. Importantly, the work draws attention to the 6Ms pedagogy schema

comprising six dimensions (Model of learning, Mode of engagement, Method of facilitation, Manner of feedback, Medium of delivery, and Map of content) by which a lesson plan can be constructed. To these six dimensions, we further add the Mindset perspective (7^{th} M), which is intended specifically for learners with ADHD. The set of four aetiological models of ADHD presents four major actors (roles) involved in education of children with ADHD. To enable the pedagogy model and the aetiological models to work together, a set of rules or guidelines are produced that guide the educator in making suitable decisions about the pedagogy. With this respect, the guidelines provided in which characteristics of ADHD are cross-referenced with learning demands, comprises a tentative reference tool for defining amongst presented choices in the pedagogy design process. Taken collectively, integration of aetiological model with 7Ms pedagogy schema offers to the literature the main novel contribution of the current study. This means that the research suggests an alternative, perhaps better, way of pedagogy for the academic area in the sense that previously it was ambiguous, whereas the researcher is trying to make it more precise.

According to Tan and Cheung (2008), ADHD children are at the risk of academic performance failure or academic underachievement. Thus, this research intended to determine what educational pedagogy is suitable for learners who have been diagnosed with ADHD. This is the reason why researchers recently claimed that:

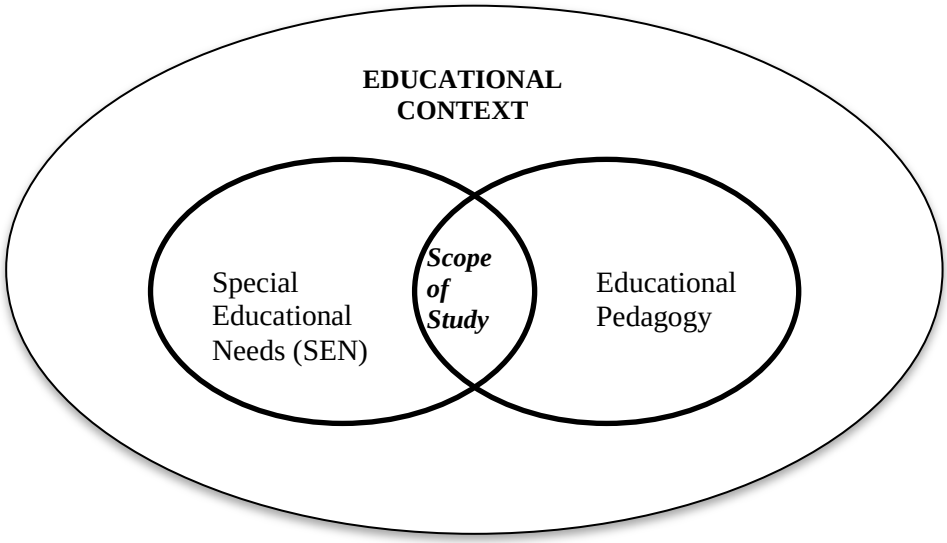
"*The move to central control of initial training meant there was more scope to ensure that the SEN element could be incorporated in initial programs through including specific training standards relating to students with special educational needs*" (Nash and Norwich, 2010; p.1473).

The central idea of this research is to present an aetiological model associated with *Attention Deficit Hyperactivity Disorder* (ADHD) and incorporate the model for designing an educational pedagogy suitable for ADHD children in an informed and controlled way. Martin (2012) states that it is significant to consider the importance of recognition of ADHD impairments, academic challenges, and positive functions in order to provide an appropriate pedagogical approach during a teaching episode. In this respect, pedagogical theories can help the instructor to develop educational policies and intentions based on individual impairments. Features of learning in types of children

with different natures of disorder require relevant pedagogy. Consequently, the consideration of pedagogical approaches is significantly vital to develop theories based upon the learners' characteristics.

According to Figure 1-1 presented below, the original aim of this research is '***to improve the provision of pedagogically sound support for special educational needs learners***'. In further investigation, this research has focused on pedagogical interventions appropriate for ADHD children. This means that as a part of development, the researcher should determine the beneficial effects of ADHD that impede or facilitate the learning process.

Figure 1-1: The scope of this research



Source: Developed for the purpose of this research

1.2 Rationale and Boundaries of the research

Educational progression of individuals with special needs differs significantly from education of typical developing learners (TDLs) due to differences in perception (Humphrey *et al*., 2013). In fact, it is expected that special schools consider children with special education needs (SEN), their capabilities, skills, and different impairments.

A number of internal and external influences have to be taken into account with regard to the quality of the educational process. In general, special children with a set of learning impairments have potentially greater academic needs compared with typical learners. Accordingly, one central task in educational context is to pay more attention to children with severe difficulties in schools (Keslair *et al*., 2012). In this respect, the study of (Efstratopoulou *et al*., 2012; p.196) states:

"*Many children facing symptoms of attentional, emotional, behavioral or developmental problems are placed in public elementary schools without a first screening. These children are "at risk" for school failure, emotional difficulties and significant negative adult outcomes compared to their peers.*"

As explained above, it is clear that different types of disorder may affect academic underachievement. Hence, the importance of educational interventions has been realised by schools. The movement that supports learning outcomes for children with special needs has been identified as a critical practice for schoolteachers (Ohan *et al*., 2011).

Therefore, the research boundary has been set according to the purpose of this study. The significance and novelty of this research lie in the proposals to support ADHD learners and assist them to overcome their academic weaknesses/challenges through appropriate pedagogically sound interventions. Therefore, in order to contribute to development of a suitable pedagogical approach for children who are diagnosed with ADHD, issues of having ADHD are discussed within the scope of the research. Despite huge amounts of research on ADHD, learning difficulties, and interventions for special educational needs (e.g. Brossard-Racine *et al*., 2012; Eiraldi *et al*., 2012; Lee *et al*., 2012; Tsai *et al*., 2012; Efstratopoulou *et al*., 2012; Humphrey *et al*., 2013), there are areas, which need further attention. In addition, this study finds that ADHD strengths and individual advantages, through both literature investigation and empirical data, emerged from the study. This research is also interested in how learning materials based on educational goals deliver to children with ADHD as well as how different roles of teachers may support children in order to construct new knowledge and boost their learning outcomes. The meaning of 'deliver learning materials' is re-addressed in both the literature and analysis chapters. Overall, an educational framework that relies on pedagogical principles must incorporate interventions that can compensate for the

consequences of every individual learning difficulty (i.e. lack of attention, distraction, poor motivation, and poor communication). The following section will explain the research aim and objectives in detail.

1.3 Aims and Objectives

The aim of this study is:

To develop an appropriate teaching pedagogy model for special educational needs (SEN) learners, particularly children with ADHD that provides support and help to manage academic and social limitations. In order to facilitate an approach to the aim of the study, six objectives have been identified as follow:

- Determine pedagogical principles in order to develop a literature-based pedagogical model
- Evaluate the pedagogical model from which to develop a suitable educational pedagogy for ADHD learners
- Develop an aetiological model of ADHD-associated determinants of learning from the perspective of multiple stakeholders
- Evaluate the aetiological model of ADHD
- Incorporate the aetiological model into a pedagogy model that will:

  (a) Aid the interpretation of ADHD signs in terms of specific learning needs; and

  (b) Enable the design of a specific pedagogy comprising appropriate didactic interventions
- Evaluate the ADHD pedagogical model.

1.4 The Research Questions

In order to narrow down the investigation and focus on the research aim and objectives, this study has developed different research questions, which can formulate data collection strategies. Specifically, the research questions, which will be investigated are outlined below:

- What makes ADHD children different from typically developing learners? In other words, what are the specific ADHD impairments and advantages that might play significant roles in academic and life contexts?

- How do different groups of ADHD experts, ADHD coaches, teachers, and parents consider ADHD with respect to learning?

- What are the differences between the perspectives of professionals and parents on ADHD strengths and impairments?

- What are the different roles taken by teachers in the classroom and how can different roles coordinate to help learners through different challenges?

- How can a suitable pedagogy be designed that can help ADHD learners with their academic achievements?

Through the evidence and facts established from answers to the research questions above, the researcher is intending that both special teachers and children with ADHD will benefit from this research through the understanding of the main ADHD weaknesses and strengths. The researcher is also seeking to fill the gaps in our knowledge about children with ADHD and suitable pedagogy intervention that can be applied.

1.5 Methodological approach

In order to approach the research questions and their final aim, methodological triangulation has been applied to this study. The mixed methodology has been addressed in three phases: the first phase of secondary data sources primarily investigating two areas of pedagogy and ADHD context; the second phase, a qualitative approach through observations and semi-structured interviews; and the third phase, a quantitative method through an online questionnaire. According to Creswell and Plano Clark (2011), the research in this study is following a ‘sequential exploratory design’ in which the researcher seeks to determine or develop the outcomes of one methodological approach with the other methodological approach, which means firstly secondary data,

then, qualitative data collection, followed by quantitative data collection, and final evaluations of qualitative study. As a result, findings of these approaches are integrated within interpretation.

The aim of this study requires understanding of the field of special needs, particularly ADHD on one hand, and the pedagogical approach on the other. Hence, data were collected from four groups, including ADHD experts, ADHD coaches, teachers, and parents in the qualitative study and two groups, ADHD professionals and parents, in the quantitative study, to identify ADHD's cognitive impairments, ADHD strengths, and the link between different ADHD impairments, which seeks to verify the aetiological model of ADHD through different perspectives. Therefore, the operation of research was designed as follows:

- ***Inductive approach***
  - Building a pedagogical model (6Ms)
  - Building an aetiological model of ADHD

- ***Deductive approach***
  - Testing (6Ms) model
  - Testing (7Ms) model
  - Testing an aetiological model of ADHD

1.6 Contributions

This study has produced substantial contributions at both theoretical and practical levels. This research makes theoretical contributions at the level of theory development to expand the focus of educational principles and learning process of ADHD children in order to integrate these two perceptions in a new context called '*pedagogical approach*'. This research further has offered a pedagogical schema '6Ms' that serves to facilitate well-informed and targeted design decisions over pedagogy. Testing the 6Ms pedagogy model through literature investigation, observing teachers, and interview shows the validation of different dimensions, which have explored through reviewing the literature. Evidence from data analysis illustrates that the 6Ms model is applicable for typically developing learners as well as those with special educational needs (SEN).

However, model revisions are required in order to complete the pedagogical framework suitable for ADHD children. In this respect, the aetiological model of ADHD developed seeks to identify different levels of ADHD impairments and the relationships between them. In addition, ADHD strengths and advantages have been examined in order to find out potential capabilities of children. Subsequently, testing the aetiological model of ADHD through interviews and questionnaire expresses the validation of the model through four perspectives, namely expert, coach, teacher, and parent.

As a result, the 7Ms pedagogical model developed, which presents not only the 6Ms criterion pedagogy as an effective educational model, but also it introduces a significant pedagogy criterion named '***Mind perspective***'. This has resulted from the pedagogy model evaluation. In this respect, the research contributes to verifying the 7Ms model which offers four critical roles of special teachers who are looking at different perspectives. The four roles and perspectives including: **expert role:** Clinical/ diagnostic perspective; **coach role:** Developmental/life & work management perspective; **teacher role:** Diagnostic/didactic/pedagogic perspective; and **parent role:** Wellbeing/emotional/daily life perspective. In addition, a tentative guideline of the pedagogy model has been provided in order to help teachers make decisions on appropriate options of pedagogy criteria.

1.7 Outline of the thesis

The study is divided into seven chapters, which are explained as follows:

Chapter one: Introduction: this presents the background of the study to identify the scope of research. It offers an introduction to the boundaries of research to explore what are the novel aspects of this research. The chapter also highlights the original aim, objectives, and research questions followed by the methodological aspect. Finally, it focuses on the main theoretical and practical contributions.

Chapter two: The literature review: this chapter is divided into two sections:

- Section (1) refers to pedagogy context. This section discusses different perceptions of pedagogy and its main concepts. Several interpretations of pedagogy have been examined. Three significant pedagogy models have been

discussed and reviewed. This section cultivates its pedagogy dimensions from different perspectives into different contexts. The review focuses on the pedagogical elements of an instructional design with the ability for learners with special educational needs (SEN).

- Section (2) reviews the literature on Attention Deficit-Hyperactivity Disorder, including a brief history of ADHD, the concept/terminology of ADHD, core symptoms of ADHD, two significant ADHD models, aetiology of ADHD, strengths of ADHD and clarification of positive aspects, effective interventions for ADHD, and finally it covers education and ADHD.

Chapter three: Research methodology: this chapter starts with the research philosophy (epistemological stance, ontology, and methodological approach) and its justification, research design, research strategy, and research process, followed by data collection and methods for the data analysis. Three phases, including secondary data analysis, qualitative, and quantitative data analysis have been applied within the study. Finally, the chapter discusses trustworthiness covering both aspect of qualitative and quantitative data analysis.

Chapter four: Data collection, Analysis, Findings: this chapter divided into two parts:

- Part one, separated into two sections:
  - Building (6Ms) pedagogy, and
  - Evaluating the (6Ms) Pedagogy model

- Part two, likewise separated into two sections:
  - Building the aetiological model of ADHD, and
  - Validating the aetiological model of ADHD

Chapter five: Quantitative analysis: this chapter presents findings from an online survey which is analysed through Non-Parametric statistical tests. It follows the selected statistical tests, including Mann-U Whitney Test and Spearman's Rank-Based Correlation Test, with the aim of presenting the results based on the research aim, objectives, and primary research questions.

Chapter six: Discussions: this chapter reviews the study and proposes a comprehensive discussion of the findings while emphasising the implications and the developed experience from the conclusions. The chapter determines the final approach of this thesis, which summarises the novelty of the research and provides answers for research questions.

Chapter seven: Conclusion: this chapter discusses the link between research novelty and gap in the research. It also focuses on the boundaries and limitations, which refer to the possible weaknesses of the study. The chapter then advises recommendations for future research.

The next chapter will discuss the literature review in two sections of ‘Pedagogy’ and ‘Attention Deficit Hyperactivity Disorder’.

Chapter Two: Literature review

2.1 Introduction

This chapter is divided into two sections: (1) Pedagogy and (2) Attention Deficit-Hyperactivity Disorder (ADHD). Section (1) presents a significant analysis of the literature on educational pedagogy. This literature review intends to investigate the concept of '*pedagogy*' based around various interpretations and significant themes within the educational context in order to provide a comprehensive understanding of the phenomenon. Moreover, this section supports the researcher in developing the pedagogical model, '***6Ms*** pedagogy schema', and provides details on the pedagogy dimension. This review also focuses on the pedagogical elements of an instructional design that enables learners with special needs to take a full and active part in learning with typically-developing learners (TDLs). To understand the background on special educational needs (SEN), the researcher reviewed previous studies; specifically, ADHD.

Section (2) required provides clarification of definitions of and the keywords used to explain ADHD. Therefore, the literature on ADHD offers analysis through introduction to terminology. The researcher also highlights different ADHD models in order to provide a comprehensive understanding of the phenomenon (core symptoms and impairments associated with AD/HD). Hereafter, this review also highlights the strengths and positive aspects of ADHD. Different types of interventions for ADHD children will be examined. Finally, the researcher argues the link between education and ADHD difficulties and / or learning difficulties.

Section 1: Pedagogy

2.2 Individualisation Tendencies in Pedagogy

The section of the literature review summarises the concept of 'pedagogy' and its use in different contexts. Examination of pedagogy provides insight into the nature of knowledge or teaching, defines learning and focuses on teacher-learner interactions. Therefore, this subchapter begins with a review of the terminology used and definition of pedagogy.

2.2.1 Terminology and Definition of Pedagogy

A number of research have been conducted in relation to the phenomenon of ***pedagogy*** (see Table 2-1). However, many areas require further investigation. The term 'pedagogy' is a Greek word that refers to the training and education of children or adolescents. More precisely, pedagogy is the act of instructing and the methods used to enable students to think in a new way (Murphy and Wolfenden, 2013). The early studies of Paulo Freire in 1970 focused on the societal relationship between the teacher and learner. Hinchliffe (2001, p.32) defines pedagogy as '*instrumental learning*'. Furthermore, he suggests that pedagogy:

"*Seems to be connected with ideas of training and discipline with the purpose of developing the well-formed person*".

In education and academic arenas, the term 'pedagogy' is an essential concept comprising several interpretations. However, the main concern is with the quality of teaching methods and learning instruments (Gore *et al.*, 2004; Harper *et al*., 2004). Conole and colleagues (2004) claim that pedagogy is a theory used for effective learning design. However, pedagogy is often confused with teaching methods or learning theories, which can lead to misunderstandings in terms of adapting different pedagogies to a given learning theory. For instance, the studies of Girvan and Savage (2010) examined constructivism learning as a theoretical approach in a virtual learning environment, with the aim of designing an effective pedagogy. In fact,

several research have also contributed to pedagogy as an educational learning theory (for example, constructivist pedagogy) (Welsch and Jenlink, 1998; Reynolds, 2000; Tenenbaum *et al*., 2001; Conole *et al*., 2004; Garcia and Pacheco, 2013). To illustrate the significant of social interaction for children to benefit learning, Sage and Baldwin (2010, p.1094) define pedagogy as:

"*A communicative form of social learning and teaching that conveys knowledge applicable beyond a given social interaction*".

Alexander (1992) described pedagogy in educational practice as introducing teaching methods. Interestingly, the pedagogy conceptions cited above all fall within the unique definition of the '*science of teaching*' (Simon, 1999, cited in Stevenson, 2008). Moreover, a number of studies have defined pedagogy as the usage of technological experimentation, effective teaching techniques or educational disciplines. These require the integration of technology into pedagogy (Harris and Wambeam, 1996; Lee, 2005; Colby and Colby, 2008).

Bennett (1988) defined the theory of pedagogy as '*Models of teaching styles*'. In this respect, Stevenson (2008, p.837) posits that "*Pedagogy is purposeful behavior with specific motives and desired outcomes, which mean it can be analyzed as an activity structure*".

However, Thompson (2006 p.194) identified pedagogy as "*An important aspect of teacher education and the teacher educator's pedagogy can help the preservice teacher understand the complexities inherent teaching*".

Overall, the current research has discovered no specific, widely-established definition of pedagogy. Furthermore, each theory or perception of pedagogy yielded a different explanation in the available literature. Therefore, the researcher argues existing pedagogy interpretations that have been investigated so far. As Table 2-1 presents, there are some commonalities that support a comprehensive understanding of the meaning of the phenomenon.

Table 2-1: Pedagogy Interpretations

Author	Paper	Pedagogy definition
Freire, 1968	Pedagogy of the Oppressed	Pedagogy focused on the relations between teacher-learner-society
Hinchliffe (2001)	Education or pedagogy	Pedagogy refer to an '*instrumental learning*'
Gore *et al.*, 2004	Towards better teaching: productive pedagogy as a framework for teacher education	Pedagogy considered as a quality of teaching methods
Harper *et al.*, 2004	Distance learning, virtual classrooms, and teaching pedagogy in the Internet environment	The term pedagogy has referred to teaching methods
Conole *et al.*, 2004	Mapping pedagogy and tools for effective learning design	Pedagogy refers to a learning theory which used for effectual educational learning design
Girvan and Savage (2010)	Identifying an appropriate pedagogy for virtual worlds: Acommunal constructivism case study	Pedagogy has been defined as a learning theory (*i.e.* constructivism)
Sage and Baldwin (2010)	Social gating and pedagogy: Mechanisms for learning and implications for robotics	"Communicative form of social learning and teaching that conveys knowledge applicable beyond a given social interaction" (p.1094)
Alexander (1992)	Still no pedagogy? Principle, Pragmatism and compliance in primary education.	Educational practice as introducing teaching methods and association
Stevenson (2008)	Tool, tutor, environment or resource: Exploring metaphors for digital technology and pedagogy using activity theory	"Science of teaching" (p.837) Pedagogy is purposeful behavior with specific motives and desired outcomes, which means it can be analysed as an activity structure
Bennett (1988)	The effective primary school teacher: the search for a theory of pedagogy	Models of teaching styles
Thompson (2006)	Powerful pedagogy: learning from and about teaching in an elementary literacy course	"*Pedagogy is a critical and complex aspect of teacher education; it can be thought of as both one element of the content of teacher education, as well as the process of teacher education*" (p.204)

Source: Developed for the purpose of this research

The definitions presented above illustrate that pedagogy can be interpreted in various ways. From the explanation provided in table 2-1, pedagogy is defined based on commonalities that have emerged from prior studies through careful consideration of different aspects.

2.2.2 Pedagogy Dimensions

This research explores and reviews the significant literature in order to identify areas that require further academic attention and investigation. According to the discussion earlier in this chapter, all definitions of pedagogy are related to the science of

teaching. However, different pedagogy dimensions have been explored through this study, including:

- Gore *et al.*, (2004) suggested that productive pedagogy (PP) can be divided into two major concepts: **(a)** integration of a teacher education programme into productive pedagogy; and **(b)** re-evaluation of teacher education significances. Since the study of Gore and colleagues has focused on the model of PP, '***teacher development***', four dimensions have been suggested to promote student learning outcomes: *Intellectual quality* (refers to higher thinking, deep knowledge, deep understanding, substantive conversation, knowledge problem and metalanguage); *Relevance* (concerns knowledge integration, background knowledge, connectedness to the world and problem-based curriculum); *Supportive classroom environment* (identifies learner control, social support, engagement, explicit criteria and self-regulation); and *Recognition of difference* (explains cultural knowledge, inclusivity, whether the teaching principally is narrative, group identity and citizenship). Thus, productive pedagogy dimensions challenge expected understandings of the importance of teacher education programmes that support students to enhance their learning outcomes.

- According to Cremin *et al*., (2006), the need for better education emphasises ***creative teaching and its pedagogical strategies*** in order to enhance purposeful student engagement. They added: "*This highly focused reflective posture/action allowed unintended as well as intended learning outcomes to be noticed and celebrated. It also enabled the children to immerse themselves in playful activities without interruption, developing both questions and self-determination in the process of finding and solving problems*" (p.115).

- Similarly, Nash (2003) discussed the success and failure of students at school; thereby raising the question; 'what types of pedagogy are most likely to enhance students' success in learning?' This study focused on appropriate pedagogy: "*Refers to the way knowledge is transmitted, and belongs with*

'curriculum' as the way knowledge is organized, and 'evaluation' as the way knowledge is realized" (p.756).

- Mccormick and Scrimshaw (2001) discussed the place of **ICT** in education and its pedagogy dimensions. Specifically, they examined the following six dimensions: educational goals and purposes; learning view; knowledge view; learning and assessment; interactions between learner and teacher; and the classroom discourse (Leach and Moon, 1999).

- Research has been conducted on educational strategies for teaching **self-study**. For instance, Lunenberg and Samaras (2011) argued the need for guidelines in order to provide suitable self-study pedagogy. Therefore, the goals covered the following two aspects: (1) students' facilitation for self-study education as an individual task; and (2) provide a cooperative and sympathetic classroom environment in which to stimulate individual student activity.

- Blatchford *et al*., (2003) discussed new pedagogy approaches, consisting of '*knowledge-based constructivism*' and '*effort-based learning*' in educational psychology (classroom context). The discussion centred on collaborative learning and social pedagogy, analysing both the Vygotskian concept and Piagetian theory. Learning theories have been integrated frequently into pedagogical models that focus on a particular approach (*i.e.* behaviourism, cognitivism, constructivism, and social constructivism). The characteristics of these approaches of learning theories will be explained later in this chapter.

In conclusion, the discussion above aimed to formulate dimensions for educational pedagogy design. In this section, the researcher investigated certain principles in order to develop educational strategies for teaching; therefore, these principles have typically been considered and have influenced learning systems. Consequently, part of the discussion in this research comprises the need for further investigation into methodologies that focus on pedagogical models and frameworks. The following

section presents the findings of existing pedagogical models cited in the available literature.

2.2.3 Educational Pedagogy Models

This section reviews existing pedagogical models and theorises a set of interrelated dimensions with which to design educational pedagogies.

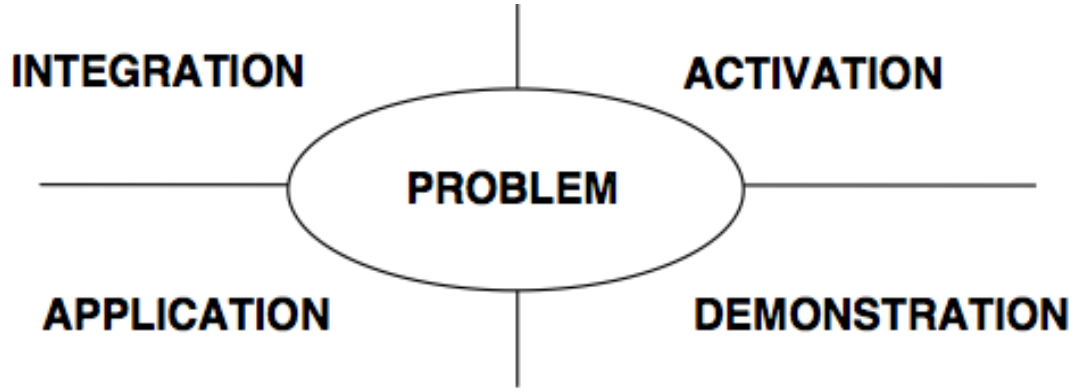
2.2.3.1 Review of three Pedagogy Frameworks

According to the researcher's investigation, this section provides three pedagogical models. Merrill's pedagogical model proposes that 'problem-based learning' is the most effectual learning environment in which the learners are involved in the process, as outlined below (Merrill, 2002):

- Activation of prior knowledge (learning is assisted when learners recall information/experiences from their memory)
- Demonstration of skills (learning is assisted when learners receive new knowledge)
- Application of skills (learning is assisted when new knowledge is applied practically by the learners)
- Problem-based principles (learning is assisted when learners engage actively in a problem-based instructional environment)
- Integration of the skills into real-world activities (learning is assisted when learners' new knowledge is integrated into the real world).

Figure 2-1 illustrates the different stages of instructional practice, which relates essentially to the problem-based instruction. Accordingly, the pedagogical model of learning requires learner involvement in different stages of learning.

Figure 2-1: Merrill's Model



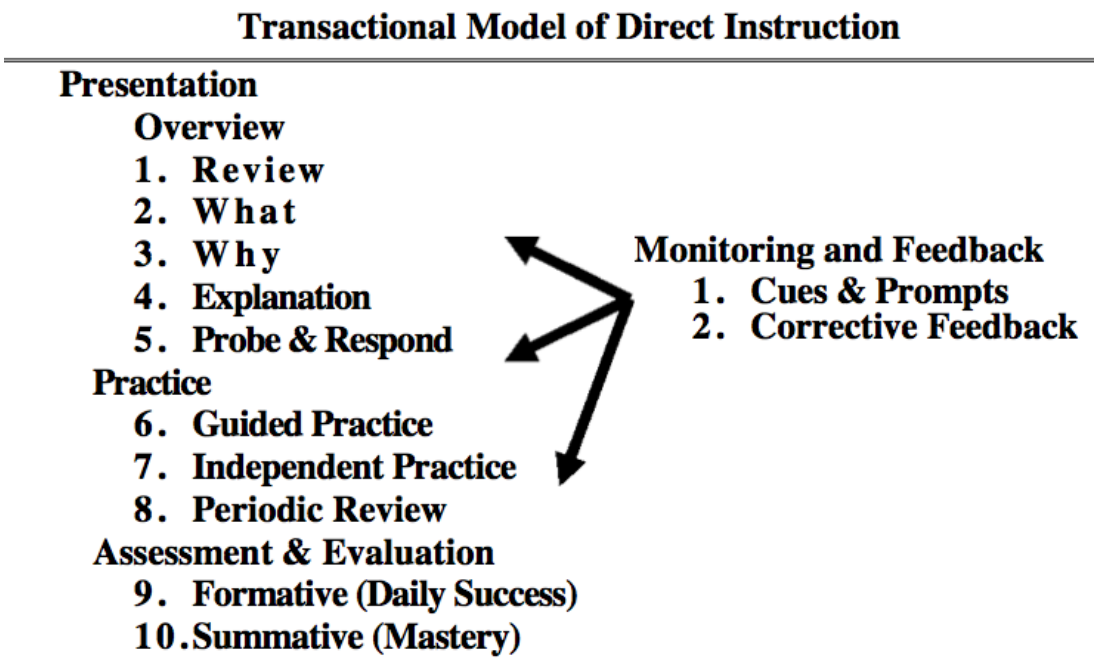
Source: Merrill, 2002

Importantly, Huitt *et al*., (2009) suggest '*a transaction model of direct instruction',* which refers to different approaches of instructional design. The model presented in Figure 2-2 consists of four different stages, including:

- Presentation
- Practice
- Assessment and evaluation
- Monitoring/feedback

Each category includes a set of instructional events to help learners successfully manage their learning. Within this model, teachers actively present new skills/learning materials to learners in an organised, step-by-step manner. Hereafter, teachers help students to practice presenting learning materials, provide them with continuous corrective feedback and evaluate their knowledge.

Figure 2-2: Transactional Model of Direct Instruction



Source: Huitt *et al*., 2009

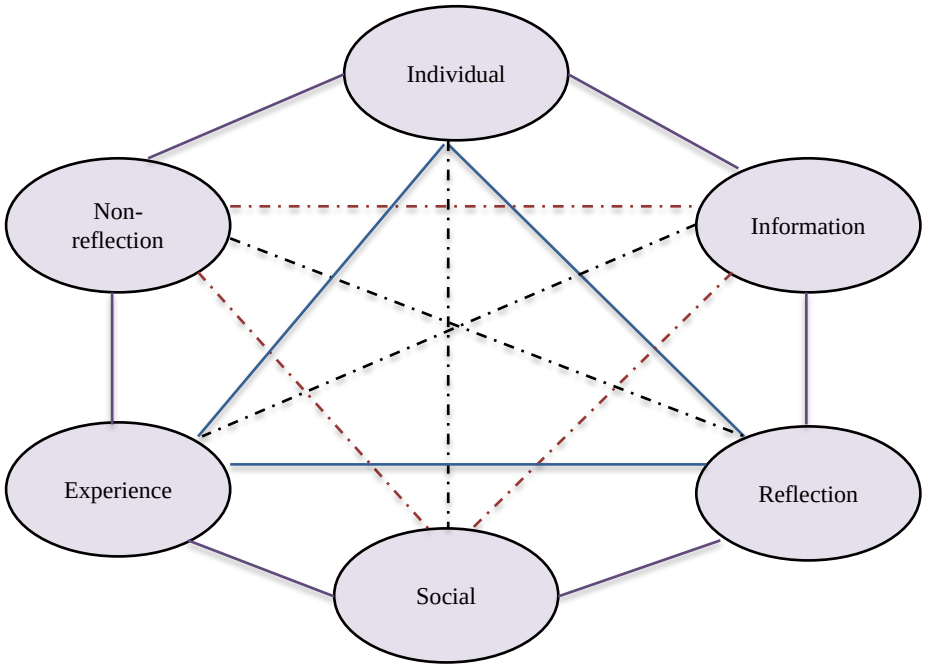
In addition to the pedagogy models presented above, Conole *et al*., 2004 also carried out an assessment of different learning theories (e.g. constructivist learning) and established a 3-D framework which can be used to map both individual learning activities and learning theories. The framework argues that any learning can be mapped along three dimensions outlined below:

- Individual learning (self-determined) vs. social learning (collaborative learning environment with instructor and peer learners)
- Reflection (conscious reflection on experience) vs. non-reflection, such as conditioning, preconscious learning, skills learning and memorisations
- Information (textual information and other knowledge artefacts) vs. experience learning arising through prior experience/knowledge, activity and practical application.

Figure 2-3 illustrates mapping of the specific learning situation alongside the three pedagogy dimensions of information-experience, non-reflection-reflection, and

individual-socially-centered learning. In this respect, the instructor can perceive which pedagogical theories best support the learner and are appropriate for specific activity during the teaching episode.

Figure 2-3: The 3D pedagogy framework



Source: Adapted from Conole *et al*., 2004

To conclude, three models of Merrill (2002), Huitt *et al*., (2009), and (Conole *et al*., 2004) presented instructional design aimed to help learners and provide a supportive learning environment in which they can achieve higher academic performance. It is important to note that the choice of appropriate pedagogical dimensions is vital for delivering an interactive teaching environment. Consequently, the question to be asked is whether three models are actually presenting learning models or pedagogical models? The researcher's investigation illuminates the existence of a research gap in the area of presenting pedagogy models suitable for learners; particularly for children with SEN (ADHD). The following section will discuss the various teaching strategies applied to different special needs.

2.2.4 Teaching Pedagogy Applied to SEN

This section will examine the work of different authors in the field of special education. Furthermore, it will examine the existing teaching pedagogies used for SEN and the limitations of appropriate pedagogy for children with ADHD.

Education naturally plays a vital role in society worldwide. Thus, a large volume of research has been conducted to develop educational tools for TDLs. However, learners with learning difficulties or SEN often find it challenging to learn in the same way as TDLs. Further, there have been insufficient studies on educational interventions for special needs in order to help children support their learning. A significant question to ask is '*could children with special needs successfully develop their learning outcomes through the similar educational pedagogy using for typical developing learner*s?' Conversely, '*what sort of modifications, principles, and interventions are needed in the learning process, specifically for non-typical learners*'.

In general, most existing ADHD interventions do not relate directly to educational settings. In contrast, their concern was on improving behavioural problems (Loe and Feldman, 2007). Unsurprisingly, there is little research in the literature on the effectiveness and appropriateness of educational pedagogy applicable to ADHD children. The research outlined below detailed selected potentials of computer technology, multimedia-based learning, visual-based learning, behavioral intervention, game intervention, and classroom-based learning although the results were too general. SEN or academic interventions have received growing attention in the literature. Hence, the table below presents a list of research conducted previously that has similar objectives to the current study. However, there are other areas that require further investigation. The researcher reviewed previous studies on education and pedagogy, giving careful consideration to different disorders (i.e. dyslexia, ASD, LD, mental handicaps, *etc.*). With this in mind, the question to be answered is: '*how can we design pedagogy appropriate for ADHD children?*'

Table 2-2: Overview of Prior Studies on SEN

Author (Year)	Paper	Diagnosed type	Focus of study	Results
		Multimedia-Based Learning		
Gross and Voegeli (2007)	A multimedia framework for effective language training	Dyslexia	Interactive learning to teach dyslexia (visual and auditory)	Significant improvements in writing skills when the small amount of training have applied
Fabio and Antonietti (2012)	Effects of hypermedia instruction on declarative, conditional and procedural knowledge in ADHD students	ADHD	Hypermedia instruction may support ADHD learners to overcome attention deficits	Hypermedia learning environment assisted students with ADHD to retain knowledge / information for a long period of time, Student performed better in learning
Groenewegen *et al*., 2008	Virtual world interfaces for special needs education based on props	Mental handicaps	To present a new teaching system (media system) to allow learners develops their skills on given tasks.	Results show that virtual environment as a new media system provides possibility of developing children's skills in different areas. All users were capable to engage in a given task correctly
		Computer-Based Learning		
Tan and Cheung (2008)	Effects of computer collaborative group work on peer acceptance of junior pupil with attention deficit hyperactivity disorder (ADHD)	ADHD	Whether collaborative group work on computer, can growth the peer acceptance of ADHD learners	Results indicate positive developments in a way to increase peer acceptance among their classmates
Rabipour and Raz (2012)	Training the brain: Fact and fad in cognitive and behavioral remediation	ADHD	How to train brain functions (attention and working memory)	Computerized cognitive exercises can develop impairments on attention. In addition, using games (computer games), can improve academic skills of ADHD children
Klemes *et al*., 2006	An assistive computerized learning environment for distance learning students with learning disabilities	LD[2]	How a computer technology (display textual, auditory, and visual materials) supports students with LD	Results illustrates positive and constructive effects of assistive technology to students with LD
Schery and O'Conner (1997)	Language intervention: Computer training for young children with special needs	Down syndrome	Use of computer-based approach to enhance language ability in order to communicate	Results shows the strongest influence of the computer training in order to teach vocabulary for a child with down syndrome

2 Learning Disabilities

Seo and Bryant (2009)	Analysis of studies of the effects of computer-assisted instruction on the mathematics performance of students with learning disabilities	LD	Examine the effects of computer-assisted instruction of elementary and secondary students on the mathematical knowledge	Results show that CAI studies on mathematics did not illustrate effective performance of LD students with large effect sizes
Vera *et al.*, 2007	Computer graphics applications in the education process of people with learning difficulties	LD (e.g. Down syndrome; autism)	The effects of computer graphic applications (education and technology tools) on learners with special needs	Different applications as a pedagogical method offer advantages for children with learning difficulties. (Tools to improve social skills; cognitive skills; language and writing). For instance: virtual learning environment
Rasanen *et al.*, 2009	Computer-assisted intervention for children with low numeracy skills	Low numeracy skills (difficulty in learning mathematics)	The use of computer game (mechanical machine facilitate learning) in order to teach numbers (the number race and verbal counting) in kindergarten	Both interventions (the number race and verbal counting) developed children's skill (positive outcome)
Wainer and Ingersoll, 2011	The use of innovative computer technology for teaching social communication to individuals with autism spectrum disorders	Autism	Use of innovative technology (interactive computer programs and virtual reality), interactive multimedia: using attractive colors, animation, music, and exotic sounds	Helped them to think through and solve social situations and conflicts. Animation, attractive visual stimuli, Were used to present eight different social conflicts involving taking turns, communicating, and bargaining
Regtvoort and Leij (2007)	Early intervention with children of dyslexic parents: Effects of computer-based reading instruction at home on literacy acquisition	Dyslexic	The study aimed at investigating the use of computer-assisted program (word building technique) to improve reading skills and letter knowledge of kindergarten children	Results show that children made higher achievements on these skills in the second semester in kindergarten
			Visual-Based Learning	
Rayner *et al.*, 2009	Video-based intervention for individuals with autism: key questions that remain unanswered	Autism	The efficacy of video-based learning on children who have diagnosed with autism	Results demonstrate that a range of procedural alternatives based upon the use of video have approached positive and effective interventions for a number of target behaviors
Kagohara *et al.*, 2012	Teaching picture naming to two adolescents with autism spectrum disorders using systematic instruction and speech-generating devices	Autism	Use of picture naming as an educational activity in order to teach new vocabulary improve literacy skills	Results indicate that the systematic instructional procedures were applicable among autistic children
			Behavioral Intervention	
Fava *et al.*, 2012	Intensive behavioral intervention for school-aged children with autism: Una Breccia nel Muro (UBM)-A Comprehensive Behavioral Model	Autism	Applying language and communication interventions in order to skill building	Intensive behavioral intervention (staff training; parent training; and teacher training) had an effective influences on the autistic school-aged children
Brosnan and	A review of behavioral interventions for the treatment of aggression in	Developmental disorder	Effective interventions in reducing the degree of aggression in school-aged children with developmental	Study suggests that behavioral treatments could be successful in decreasing the level of aggression in

Healy, 2011	individuals with developmental disabilities		disabilities	children aged 3-18 years
		Game Intervention		
Lovio *et al.*, 2012	Reading skill and neural processing accuracy improvement after a 3-hour intervention in preschoolers with difficulties in reading-related skills	Dyslexic	The research aimed at investigating the use of game intervention to develop reading skills and auditory processing among preschool children	Results on the small sample illustrates the improvement of reading skills (literacy skills) through very short training and intervention that can affects children's brain
Fassbender *et al.*, 2012	VirSchool: The effect of background music and Immersive display systems on memory for facts learned in an educational virtual environment	ADHD (memory impairments)	Whether video games/virtual environments and the associated music have any influence on how much players remember from the presented information	Results show that background music played a significant role in remembering more facts correctly among ADHD children
		Classroom-Based Intervention		
Kiuru *et al.*, 2012	Teacher-perceived supportive classroom climate protects against detrimental impact of reading disability risk on peer rejection	RD[3]	Determine the role of a supportive classroom intervention for children with risk of peer rejection who also associate with reading disabilities	The study has emphasized on the significant role of teachers in developing the interactional quality of the classroom in collaborative learning environment (teacher-child interactions). Research shows children with reading disorder have more difficulties on social activities. Smaller class size is a protective component against communication difficulties. Moreover, "classroom with high emotional and instructional support may be particularly important for students who are at risk for school failure" (p. 336)
Kraker, 2000	Classroom discourse: teaching, learning, disabilities	LD	Examine the nature of effective instruction for school-aged children with learning disabilities	The study concentrated on social context of education and both verbal and non-verbal interactions between teacher-student towards learning as an effective instruction for children with learning disabilities

Source: Developed for the purpose of this research

3 Reading Disabilities

2.3 Conclusion

As stated earlier in this section, a number of studies have investigated the concept 'pedagogy' and educational pedagogy for TDLs. The literature reviewed also illustrates the attention given to different SEN (i.e. autism, dyslexia, LD, ADHD). Three pedagogy models have emerged from the literature review; however, little research has contributed to the educational pedagogy model; thus presenting a gap in the current study. Moreover, not much study has been conducted on appropriate pedagogical models applicable to SEN learners. Previous studies mostly combined educational pedagogy into different learning theories as well as technology-based learning. With this in mind, the researcher has focused on establishing a pedagogy model applicable to children with ADHD.

Section 2: Attention Deficit Hyperactivity Disorder (ADHD)

2.4 Introduction

Although there is a massive amount of research in the field of ADHD, some areas remain in its infancy (e.g. relationships between impairments, ADHD and educational pedagogy). Section (2) offers insight into and a critical analysis of the literature relating to ADHD. Moreover, this section provides solid understanding of its core symptoms. This examination also directs the researcher to develop an aetiological model of ADHD based around the theoretical foundations derived from secondary data analysis. This section begins with clarification of the meanings of the terminology and the keywords used in the study of ADHD. In order to provide a comprehensive understanding of the phenomenon, the researcher also highlights the following relevant areas: a brief history of ADHD; etiology of ADHD; different ADHD models; strengths of ADHD; interventions for ADHD; and education and ADHD. Finally, the literature indicates the advantages, limitations and consequences of the present study in terms of outlining gaps and further investigation.

2.5 Terminology Clarification

2.5.1 The Concept of ADHD

One of the prevalent neurobehavioral disorders during childhood is known as Attention Deficit-Hyperactivity Disorder (ADHD) (Schwean *et al*., 1993; Richard, 2000; Jonsdottir *et al*., 2005; Gudjonsson *et al*., 2010). Reilly (2011, p.884) stated that:

"*ADHD as described in the Diagnosed and Statistical Manual of Mental Disorders Forth Edition-Text Revision (DSM-IV-TR) (American Psychiatric Association (APA), 2000) is closely related to the category of 'Hyperkinetic Disorder' as outlined in the International Classification of Disease-10th Revision (ICD-10) (World Health Organization (WHO), 1992), with the category of 'Hyperkinetic Disorders' often seen as a more severe form of ADHD*".

In fact, different interpretations of ADHD have existed since the 1940s. Table 2-3 illustrates the different terminologies used for ADHD, which can help comprehend the significance of the phenomenon.

Table 2-3: Different Terms of ADHD

Terms of ADHD	Author
Postencephalitic behavior disorder (PBD): A brain infection eruption throughout the World War I	Goldstein and Goldstein, 1990; Weiss and Hechtman, 1993
Brain damage syndrome (BDS): Inattentive and restlessness and over aroused behavior	Barkley (2006a)
Minimal brain dysfunction (MBD): Cluster of problem behaviors in children since the post-World War I	Clements, 1971; Barkley (2006a)
Hyperkinetic reaction of childhood (HRC): Environmental problem	International Classification of disease, revision 10 (ICD-10, 1993); Weiss and Hechtman, 1993; Barkley, 2006a
Attention deficit disorder (ADD): Attentional problems	Lerner *et al*., 1995 DSM (III), 1980
Attention deficit hyperactivity disorder (ADHD): Attention and hyperactivity problems	Barkley, 2006 DSM (IV), 1994

Source: Developed for the purpose of this research

Since the 1940s, several researchers have contributed to the understanding of the concept of ADHD (e.g. Barkley, 1997; 2003; 2006a; Goldstein and Goldstein, 1990; Tannock, 1998; Brown, 2005). Investigation shows that in recent years, the knowledge trend of scientists has been improving with regard to the interrelation between different mental functions and disorders. Barkley and Gordon (2002) linked ADHD with brain abnormalities, in which they refer to the '*cognitive management*' of the frontal brain. Further, Wehmeier *et al*., (2010) estimated that, in general, 3% to 7% of school-aged children are diagnosed with ADHD; in the UK, this figure is around 3% to 5%. Barkley (2006a, p.47) defined ADHD as follows:

"*Attention-Deficit Hyperactivity Disorder is a developmental disorder characterised by developmentally inappropriate degrees of inattention, over activity, and impulsivity. These often arise in early childhood; are relatively chronic in nature; and are not readily accounted for on the basis of gross neurological, sensory, language, or motor impairment, mental retardation, or severe emotional*

disturbance. These difficulties are typically associated with deficits in rule-governed behavior and in maintaining a consistent pattern of work performance over time".

2.6 Core Symptoms of ADHD

This section explores and analyses the relevant literature relating to the core symptoms displayed by children with ADHD in order to highlight the main difficulties and areas of weakness that require extra attention and further investigation. The three core symptoms of ADHD are:

Inattentiveness: Since attention is a complex perception, insufficient classification has been found for attention skills (Posner and Synder, 1975; Hale and Lewis, 1979). Goldstein (1990) placed attentional skills into five different categories, as summarised in Table 2-4.

Table 2-4: Attentional Skills

Attentional skills	Definitions
Focused attention	Refers to inattentiveness of a child with other tasks instead of the task given by the educator/parents
Selective attention	Refers to the distraction of a child by extraneous events
Divided attention	Refers to complete two simultaneous tasks
Vigilance attention	Refers to the ability of readiness to respond as listening to the next spelling word
Sustained attention	Refers to not sufficient amount of time to complete a task

Source: Goldstein (1990)

Distraction is a recognised behavioural disorder present in children with ADHD (Mourik *et al*., 2007). Approximately one-third of learners with ADHD display inattentiveness (Loe and Feldman, 2007). Learners who are inattentive often shift their attention unconsciously to interesting events and make less effort to pay attention to the lesson. It has been stated frequently that children diagnosed with ADHD have greater difficulty focusing when people talk for long periods (Barkley and Edwards, 1998). Such learners are fans of routine activities and may become distressed when these are disrupted.

Barkley (1997; p.84) discussed the reasons behind attention deficit in his ADHD model. He asserts that:

"*The poor sustained attention that apparently characterises those with ADHD probably represents an impairment in goal or task-directed persistence arising from poor inhibition and the toll it takes on self-regulation and the distractibility ascribed to those with ADHD most likely arises from poor interference control that allows other external and internal events to disrupt the executive functions that provide for self-control and task persistence*".

Thus, there is evidence to support the links between self-regulation and attention deficit. Difficulty in paying particular attention, listening to a speaker without interrupting, distraction (verbal impulsiveness) and difficulty in following instruction are associated with attentional skills in ADHD learners.

Impulsiveness: Impulsivity has been identified as an important aspect of behavioural impairments in ADHD sufferers (DSM-IV: American Psychiatric & Association, 2000). The following three items represent impulsive assessment (Tymms and Merrell, 2011):

- Blurts out answers before questions have been finished
- Difficulty in awaiting turn
- Interrupts others

In fact, impulsive behaviours change depending on the different subtypes of ADHD. Wehmeier *et al*., (2010) suggested that impulsiveness is more likely to be associated with functional impairment. Tymms and Merrell (p.754) also state; "*cognitive impulsivity was associated with poor performance on tasks that required mental control and the ability to shift between tasks*". Children with ADHD may display impulsiveness in a variety of ways; for example, distracting their classmates by talking or writing on their notes, being impatient and acting before thinking (Flick, 1998). Consequently, the work of the whole class may be affected by their impulsive behaviour.

Hyperactivity: Hyper-activeness or over-activeness, like inattentiveness and impulsiveness, are caused by lack of self-control. Hyperactivity signifies restlessness and movement among children with ADHD. In other words, children with ADHD may unconsciously display abnormal behaviour (e.g. movements, not listening, fidgeting in their seats, playing around, talking without permission, *etc*.). Barkley (2006) stated that hyperactivity is the factor that best differentiates children with ADHD from clinical conditions and typical children. As learners grow older, hyper-activeness will become less apparent; however, it can lead to depression (Brook and Boaz, 2005; Watkins and Wentzel, 2008).

The impairments outlined above are core challenges associated with ADHD. However, the combination of such symptoms with other developmental impairments is significant. Thus, further investigation is required into the approaches that reflect not only the core symptoms of ADHD, but also the other impairments associated with ADHD in its different subtypes.

2.6.1 Other Impairments Associated with ADHD

According to Garcia *et al*., (2012), almost 70% of ADHD children or adolescents are at risk of co-morbidity. Co-morbidity is a term that refers to two or more functional or behavioural disorders that occur simultaneously (Donfrancesco *et al*., 2011). Therefore, when co-morbid conditions are present, other impairments also occur and exacerbate the ADHD. Huang *et al*., (2009, p.357) stated; "*In fact, 20-67% of children with ADHD had the comorbidity oppositional defiant disorder (ODD), 20-56% had conduct disorder (CD), and at least 25% had mood or anxiety disorder*". The neuropsychological disorder may decrease the child's capacity to manage everyday environmental demands and stresses. Interestingly, the objective of this section is to identify different impairments from inattentiveness, impulsivity and hyperactivity affecting school-aged children who diagnosed with ADHD. In general, the question is *what makes ADHD children different from typically developing learners*? In other words, *what specific impairments might play significant roles in an academic and social context*?

Table 2-5 demonstrates different difficulties associated with ADHD, which will be discussed in-depth at a later stage of the research. The literature review has identified other challenges and impairments of ADHD, which oftentimes make performance worse (Wodka *et al*., 2008), including: academic impairment; intellectual development; speech and language; motor difficulties; motivation; social impairment and emotional characteristics.

Table 2-5: ADHD Impairments

ADHD impairments	Definition
Academic impairments	ADHD characteristics lead to academic failure. This might cause by inattention (Lack of focus/attention) or deficient study skills (DuPaul and Stoner, 1994; Flick, 1998; Barkley, 2003).
Intellectual development	Brook and Booz (2005) claimed that ADHDs' IQ is normal. However, they are neurologically disabled. Some ADHD learners with high IQs might be distracted by their own thoughts.
Speech and language	Barkley (2006b) explained that although ADHDs have specific language and speech difficulties, they do not have "*serious or generalized language delays*" (p.101). Having said that, Jonsdottir *et al*., 2005 claimed, "*language impairment is highly prevalent comorbidity in children with psychiatric disorders and behavioral problems*" (p.444).
Motor difficulties	Motor difficulties often co-occurs with ADHD in which referred to Developmental Coordination Disorder (DCD). Recent studies show "*a high prevalence of Developmental Coordination Disorder (DCD) in children with ADHD. Therefore it is conceivable that children with ADHD who have motor difficulties are those who have a dual diagnosis (ADHD and DCD)*" (Brossard *et al*., 2012; p.2010-2081).
Motivation	Children with ADHD often experience low motivation toward learning. (Bolliger *et al.*, 2010) defined motivation as '*one of the significant psychological theories in education*' in order to have a successful learning.
Social impairments	A child with ADHD might also engage with social impairments (*e.g.* peer relationships or peer rejection) (Uekermann *et al*., 2010).
Emotional characteristics	The emotional characteristics of ADHD children are associated with self-regulation, depression, aggression, or anxiety, frustration, and Poor self-esteem (Wehmeier *et al*., 2010). Barkley (2006b) also added some terms such as "irritable" or "excitable" to describe them.

Source: Developed for the purpose of this research

2.7 Etiology of ADHD

Numerous explanations are provided for the reasons behind ADHD (*e.g.* Barkley 1997; Brassett-Harknett and Butler, 2007; Willcutt *et al*., 2010). In this study, the researcher has divided the etiology of ADHD into two different categories: genetic and environmental factors. Investigation into the environmental elements identifies factors, such as: poor parenting and family function; nutritional factors; Fetal Alcohol Syndrome (FAS); and neurological factors (brain and the brain development). Shim *et al*., 2008 (p.1824) stated that hypothesis on the:

"*Etiology of ADHD has evolved from simple one-cause theories to multi-factorial processes that reflect the confluence of many types of risk factors...*"

2.7.1 Genetic Factors

Studies of the etiology of ADHD indicated strong genetic impacts on the condition's symptoms (Faraone, 2005; Faraone *et al*., 2006). Hoogman *et al*., (2012, p.2) defined ADHD as "*a very common and highly heritable neuropsychiatric disorder in childhood that is strongly persistent over time*". Furthermore, the genetic impacts may distribute ADHD symptoms across the population. According to the studies of Rapport and his colleague (2006), biological influences (e.g. genetics) are considered a critical function of the distribution of ADHD.

2.7.2 Environmental factors

Poor parenting and family function

Numerous researchers believe that ADHD is associated with poor parenting and family function (Cunningham and Barkley, 1979; Barkley *et al*., 1985; McKee *et al*., 2008; Johnston *et al*., 2012). Divorced or separated parents might be counted as an example of poor parenting. However, Green and Chee (1998) claimed that a child with ADHD "*has a biological condition which is influenced by the actions of parents but not caused by poor parenting*" (p. 255).

Nutritional factors

The effects of dietary factors (*e.g.* sugar; food additive or artificial flavors) on ADHD have attracted the attention of some researchers. For example, Park *et al*., (2012) claim that nutritional factors or ingredients may influence brain function/behaviour.

FAS

FAS is associated with mothers who drink alcohol during while they were pregnant. Therefore, it influences directly the child's mental or physical function (Clarren, 2000; Barkley, 2006c).

Neurological factors

Studies explain that neurological factors refer to the brain and its development. Low intelligence, lack of motivation or laziness may not be critical factors in the development of ADHD. However, recent research indicates that the brain function "*executive function*" plays a significant role in ADHD. Barkley (2006c, p.237) suggests:

"*The executive functions are known to be mediated by the prefrontal cortex and its networks with the basal ganglia and cerebellum, suggesting that these regions may play a prime role in ADHD*".

In conclusion, there are several causal explanations for the existence of ADHD; however, its origins remain unclear. It is important to note that this research does not cover the etiology of ADHD.

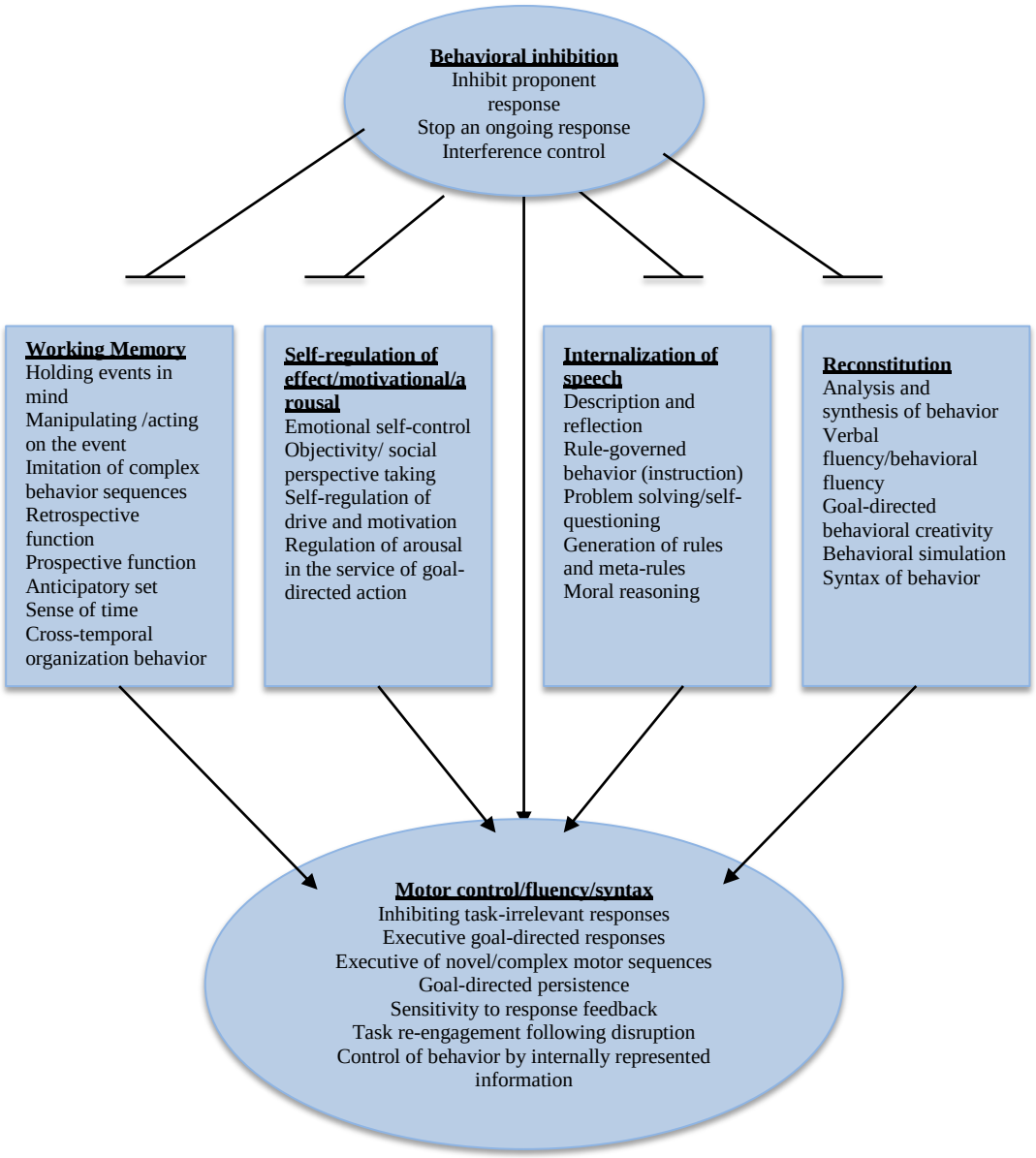
2.8 ADHD Models

2.8.1 Barkley's ADHD Model

Exploratory and descriptive research on ADHD has introduced two main models by Brown (2005) and Barkley (1997). In fact, Barkley's theoretical model provides comprehensive results on the cognitive impairments associated with ADHD. His main concern referred to either hyperactive/hyperkinetic population or hyperactive-impulsive type (APA, 1994). Hence, his model does not focus simply on

inattentiveness. Barkley (1997) has published his inhibitory control model based on executive dysfunctions (Shimoni *et al*., 2012). His theoretical model illustrates the following four executive neuropsychological functions: "*Working memory, Self-regulation, Internalization of speech, and Recognition of behavior*". In order to understand Barkley's model, several assumptions are required. In 2003, he introduced executive functioning as '*self-regulating*', which has been interpreted as a fundamental factor of ADHD type disorder. In general, he asserted that ADHD is actually a '*self-regulation deficit disorder*' (SRDD) and the reasons behind it refer to the psychological aspects of self-regulation problems. Indeed, Barkley postulated that executive functions can be specified as a unique pattern of self-regulation. Therefore, any observable symptoms among ADHD and executive function may belong to the self-regulation category (e.g. self-awareness, self-motivation, self-speech, self-control of emotion and self-restraint), which all relate to individual behaviours. Figure 2-4 illustrates Barkley's ADHD model.

Figure 2-4: Russell Barkley's Model



Source: Adapted from Barkley's model (1997)

Overall, Barkley's model is based largely on the development of '*ability to inhibit*', which is perceived as the primal executive functions. Essentially, Barkley's model offers a conceptualisation, proposing that ADHD is linked to both cognitive deficit (e.g. poor working memory, poor speech processing) and behavioural disorder (e.g. emotional/hyper activeness, inattentiveness).

In fact, the question to be asked is how has the researcher used Barkley's perception of executive function as a human mental ability to describe the cognitive deficits associated with ADHD?

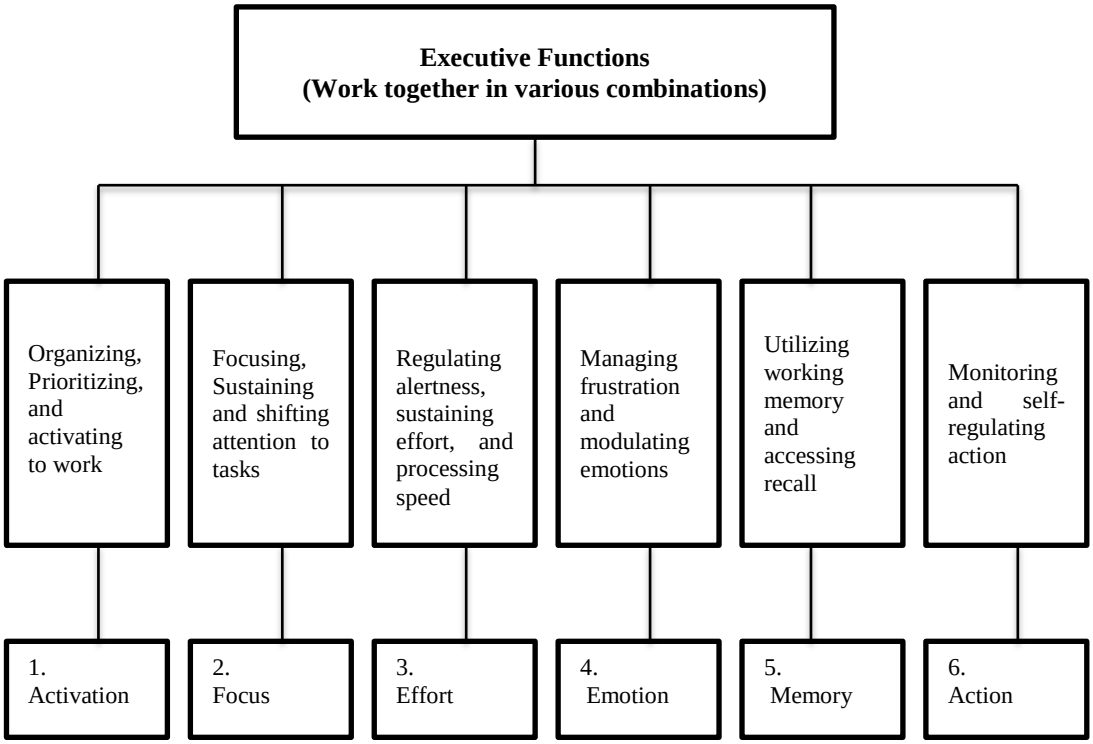
2.8.2 Brown's ADHD Model

In contrast to Barkley's ADHD model, Brown's model is established through a different initial source; although, it is similar to Barkley's model in several points. According to Brown's clinical interviews with Attention Deficit Disorder (ADD) patients, different symptoms are emphasised. His model highlights the fundamental cognitive functions and investigates six clusters, including: activation; focus; effort; emotion; memory; and action (Brown, 2008). Significantly, self-regulation of emotion is considered a critical facet of the brain's function. Since these six clusters play a vital role in daily life, individuals with ADHD are not able to manage perfectly these functions. The six clusters often appear together, thereby signifying the presence of ADHD syndrome. According to the earlier discussion, Barkley identified ADHD as a behavioural disorder through executive functions, whereas Brown's model cites behavioural inhibition as only one of six clusters. Moreover,

"*Brown emphasized that AD/HD is not simply a problem with hyperactivity and impulsivity but of the ability to monitor activity in appropriate setting*" (Brassett-Harknett and Butler, 2007, p.189).

Figure 2-5 illustrates Brown's ADHD model:

Figure 2-5: Thomas Brown's Model



Source: Adapted from Brown (2005)

As can be seen in the diagram above, the executive functions associated with abilities in 'goal-oriented processes' include organising; focusing/sustaining focus/concentration; planning motor skills; working memory; monitoring; and managing emotional problems. All aforementioned factors require action and effort in order to monitor learning and academic performance. It is significant to note that children associated with ADHD are not able to assign mental and emotional effort to adapt themselves to meet the demands of different situations.

To conclude, Barkley and Brown described ADHD as the developmental impairment of executive functions (Brown, 2009; Barkley, 1997), although it has been recognised as disruptive behaviour for more than one-hundred years. In fact, Brassett-Harknett and Butler (2007) asserted that ADHD may present itself in different ways and may result from various causes, which make it a very complicated disorder. Overall, ADHD impairments and main symptoms from different aspects remain controversial, particularly in relation to executive

dysfunctions (Shimoni *et al*., 2012). However, what differentiates ADHD children from typical children is the level of distractibility, hyperactivity and impulsive behaviour that cause failure in both their social and academic lives. With this in mind, the question to be asked is; 'what is a suitable pedagogy design that can help children with their academic achievements'*?* Accordingly, the need for a new ADHD model emerged in order to investigate the relationships between different ADHD impairments, which will be discussed further in Chapter Four.

2.9 Strengths of ADHD

While numerous researches have looked at the negative aspects of ADHD (Barkley, 1997; 2003; 2006a; Goldstein, 2002; Winstanley *et al*., 2006; Loe *et al*., 2007; Groom *et al*., 2008; Carlotta *et al*., 2011; Shimoni *et al*., 2012), little study has been conducted on the benefits of having ADHD. So, the researcher will now consider the literature focusing on the advantages of having ADHD. Interestingly, this research has discovered that a number of impairments explained earlier could also be advantageous in some circumstances. For example, some ADHD learners demonstrate the ability to ***hyper-focus*** (refers to hours of engagement, mental attention or concentration on a concept) (Brown, 2006); while others are adept at ***multitasking*** (Siklos and Kerns, 2004) (able to process multiple tasks of interests simultaneously and effortlessly switch without breaking). Fluency in ***creativity and imaginative*** (White and Shah, 2006; 2011) (generating original ideas) and copious amount of energy (Tymms and Merrell, 2011) (***Blurting out answers***) can, in some cases, be detrimental to learning, but in other situations can be very desirable. The following section will discuss in detail the positive aspects of ADHD.

2.9.1 Clarification of the Positive Aspects of ADHD

One of the main positive aspects of ADHD, ***Hyper-focus***, defines when a child is absorbed in a task or activity that is exclusively of interest to him/her. This illuminates hours of engagement, which refers to mentally paying attention to a concept or mode. Brown (2006) noted that any individual with ADHD might maintain focus in some domains with little difficulty. Additionally, while paying particular attention to interesting stimuli, they have the potential to process information at hyper-speed and decisions may be made rapidly. In such situations, the positive criteria of a rapid-fire mind become clearer.

Other strengths of ADHD relates to impulsive behaviour. Although several studies described impulsivity as a behavioural symptom of ADHD, Tymms and Merrell (2011) asserted ***impulsiveness*** as an academic positive function. Being energetic and participative with ADHD can be a desirable quality in some circumstances. The term '***Blurting out answers'*** is identified as a significant factor on the teachers' rating scale. Likewise, Mayer (2004) proposes that impulsivity is a key to learning, which could be an indication of cognitive engagement.

As explained in Section 2.7, ADHD has negative consequences on academic achievement, although there may be potential for ***creativity*** and ***innovation*** (White and Shah, 2006). Further investigation by White and Shah (2011) suggests that levels of creative thinking and achievement not only affect laboratory activities, but also impacts on real life. In other words, a child with ADHD has the potential to generate a novel idea or take an idea into multiple directions. However, in some cases, those who do not have ADHD can take an idea and remain focused on a specific subject. Carosn *et al*., (2003) claimed that highly-creative individuals with ADHD perform with lower levels of executive inhibition; however, they perform better on divergent thinking tasks, which define the phrase '*thinking outside the box*'.

Conversely, the term 'multitasking' originated in the field of computer science; it refers to the ability to process simultaneously several tasks or activities. Interestingly, the human brain can cope with more than one task or activity at a particular time. For example, cognitive theory of multimedia learning in Mayer's work (2001) asserted that information could be processed in both visual and verbal channels through the integration of knowledge. However, the human brain has a limited amount of capacity for processing information (Moreno and Mayer, 1999). Recent investigation has shown that children with ADHD are able to ***multitask***. Significantly, approximately all of the advantages described so far can work accurately for the task/activity that passionately interests them. Shallice and Burgess (1991) introduced SET (Six Elements Task) as a multitask test, with which to activate and assess the SAS (Supervisory Attentional System). Siklos and Kerns (2004) have applied the SET test to ADHD children in order to investigate whether

younger children with ADHD display a multitasking deficit. According to the task allocated to the children, poor planning, poor organising and poor monitoring has been identified in order to complete task. In contrast, some tasks require creativity rather than planning or organising. In such case, surprisingly there is a possibility of ADHD children performing higher in relation to multitasking.

Table 2-6 illustrates the positive dimensions presented in this section. Overall, this section explored the notion that the positive and constructive reaction of three functions of cognitive, psychological, and behavioural strengths is under the condition of interest in the tasks or activities given by the instructor.

Table 2-6: Positive Dimensions of ADHD

Key factor	Sub-factor	Description	References
Hyper-Focus	Hours of engagement	Absorbed in task which exclusively interesting	Brown (2006)
Impulsiveness	Blurt-out	Act before thinking	Tymms and Merrell (2011)
Creativity / Innovative	Idea generator / Thinking outside the box	Potential to generate novel ideas	White and Shah (2006; 2011)
Multitasking	Knowledge integration	Brains' performance on processing multitask of interest	Siklos and Kerns (2004)

Source: Developed for the purpose of this research

2.10 Interventions for ADHD

Provision of effective interventions for children and adults who are diagnosed with ADHD is varied. However, more significant is the correct recognition of the disorder in order to provide appropriate intervention and support (Ingersoll, 1998; Flick, 1998; Moghadam, 1988 Barkley, 2006a; Ciuhan and Vasile, 2010). Different intervention settings have been suggested so far, whereby the central goal is to help ADHD children improve their skills and overcome their limitations.

2.10.1 Psychotherapy

Psychotherapy as a form of treatment is recognized as essential in helping to reduce the core symptoms. Evidence shows that psychotherapy is still used in clinics (Ciuhan and Vasile, 2010). Ingersoll (1998, p.105) defined psychotherapy as:
"*A wide variety of methods and techniques aimed at helping people make changes in their attitudes, emotions, and behavior patterns*".
Behavioural modifications and cognitive behavioural interventions that focus on self-monitoring and self-instruction are different types of psychotherapy interventions (Flick, Ingersoll, 1998).

2.10.2 Medications

Medication has been identified as a first choice of treatment, and has helped children with ADHD to perform better at school (Barkley, 2006; Moghadam, 1988). However, 20-30% of children do not respond positively to medication (Barkley, 1998; Danforth *et al*., 2006a). Flexibility in the results of using medication signifies that it is not an appropriate intervention as not every individual with ADHD will respond well.

2.10.3 Parent Training

Several studies are concerned with the effectiveness of behavioural parent training as an intervention (e.g. Huang *et al*., 2009; Johnston *et al*., 2012). Evidence shows that "*behavioral family intervention program (BFIs) based on social learning models (e.g. Patterson, 1982) are the most extensively evaluated form of psychosocial intervention for children, and are effective in reducing family risk factors associated with child behavior problems*" (Turner and Sanders, 2006; p.131). Significantly, parent training may not boost the learning performance of children with ADHD; however, it may result in constructive changes in their behaviour.

To conclude, Pelham (2007) suggests that using solely pharmacological treatments could remove incentives for teachers, schools and parents to try harder and work on other interventions; for instance, different educational pedagogies. In fact, medication alone does not often have positive influences on critical variables (e.g. academic achievement, group working/social skills and concurrent family). Consequently, some researchers have criticised medicinal treatments (e.g. Bratter,

2007). In contrast, Loe *et al*., (2007) and Brackenridge *et al*., (2011) believe that medication is the most commonly-applied treatment that improves considerably the classroom and social behaviour of a child with ADHD. Thus, schools and the medical community still consider medication as the most effective intervention for a child with ADHD in terms of helping them behave as typical learners (Brinkman *et al*., 2012). Multi-dimensional intervention is required in order to support school-aged children with ADHD. Overall, both schools and parents can help children with ADHD. The question to be answered is 'how can the different roles of teachers help ADHD children'?

2.11 Education and ADHD

Today, education plays a significant role in global society. Furthermore, investigation into education and training moves towards SEN, which indicates a demand for developing applicable teaching methods in this field. Nash and Norwich (2010, p.1472) noted that:

"*The framework for special needs education in the UK was established in the 1981 education legislation based on the Warnock Report (1978). The Warnock Report recommended that all teachers needed to appreciate the extent and range of special educational needs; the patterns of provision that were available for them; procedures for identifying special educational needs; the importance of working closely with parents; the significance and usefulness of inter-professional collaboration for these children; and the importance of positive attitudes and the skills required to work with these pupils*".

As explained earlier in this chapter, ADHD is a common developmental/neurobehavioral disorder that affects 3-7% of school-aged children (Wehmeier *et al*., 2010). Therefore, every school should be prepared for all types of ADHD (i.e. hyperactive, impulsive or combined). More importantly, teachers' knowledge and attitude towards children with ADHD are significant factors for schools to consider. As discussed in section (1) of the literature review, it is vital to reference that prior studies have paid extensive attention to SEN (*e.g.* Alty *et al*., 2006; Beacham and Alty, 2006; Khan, 2010; Ohan *et al*., 2011). According to the earlier discussion, ADHD is associated very closely with education. It is clearly

known that school presents a great challenge for these children. Hence, the teacher's attitude should be flexible and fits into these categories; likewise for TDLs.

Several ADHD challenges have been established throughout teachers' observation in the classroom. For instance, disruptive behaviour between peers or group learning, difficulties interacting among peers, poor social skills, aggression, anxiety, depression, memory disorder, lack of attention, speech/language disorder, which may all contribute to academic failure (French *et al*., 2003; Mourik *et al*., 2007; Uekermann *et al*., 2010; Ohan *et al*., 2011; Shimoni *et al*., 2012; Gut *et al*., 2012). Overall, ADHD is a serious psychiatric, which has direct influence on students' learning performance. Identification of appropriate educational strategies that will offer the greatest value to children with ADHD is vital. It is acknowledged that many children diagnosed with ADHD and/or LD experience difficulties in academic performance (Brook and Boaz, 2005). Hence, it is no surprise that ADHD is a serious disorder that may influence negatively a child's home, school and life successes.

Consequently, having successful educational strategies is essential for schools to enhance the academic performance for those with ADHD. Different teaching pedagogies have been conducted for children with SEN to develop each individual difficulty. For instance, Watkins and Wentzel (2008) established collaborative working and its effects on learning outcomes; likewise, Tan and Cheung (2008) suggested computer collaborative group work may be appropriate for learners with ADHD to cope with their impairments in relation to their social skills. Such a learning environment aimed to examine the social participation of children who experienced chronic challenges with peers or team work. In addition, it is preferable to establish a different strategy to help a child cope with his/her main limitations (Barkley, 2005; Daly, 2005; Hughes and Cooper, 2007). In general, the question is 'how can we fit ADHDs' training into the existing special education system? In other words, what teaching pedagogies require managing ADHD and academic performance?

2.12 Conclusion

ADHD is associated with a set of cognitive deficits that might be interpreted in the context of brain dysfunction. Existing literature has estimated that approximately 80% of people with ADHD are also diagnosed with other disorders (e.g. dyslexia, autism, LD) (Kaplan *et al.,* 2001). Therefore, huge emphasis has been placed on understanding ADHD in tandem with other disorders (Jonsdottir *et al*., 2005; Loh *et al*., 2012). Children with ADHD may experience critical functional deficits either at school or in their daily life (American Psychiatric Association; APA, 2004). This section draws the following conclusions:

- Although several researches have been investigated on the causality of ADHD, there remains a need to concentrate more on different relationships and the effects of the symptoms. Therefore, a new model of ADHD is required in order to investigate further the link between different impairments and advantages (strengths) among those with ADHD.

- This section has addressed ADHD developmental disorder. ADHD awareness and different functional impairments associated with ADHD are vital for experts, coaches, teachers and parents to support children to overcome their limitations. Consequently, this chapter also demonstrates the need to investigate possible pedagogical strategies that are suitable for children with ADHD and support them to meet their learning requirements.

2.13 Summary

This chapter is divided into two central sections of 'Pedagogy' and 'Attention Deficit-Hyperactivity Disorder'. In the first section, different interpretations of pedagogy are argued, focusing mainly on three pedagogy models of Merrill (2002), Huitt *et al*., (2009), and Conole *et al*., (2004). Evidence from the literature review indicates the need for developing a new educational pedagogy model. The '***6Ms***' pedagogy schema will be designed and developed later in this study (Chapter Four). Conversely, the second section of this chapter provided literature on the different impairments associated with ADHD, and which represent failure in academic performance. Reviewing ADHD literature also shows that a new model (aetiological

model of ADHD) is needed in order to find out the link between different impairments. Moreover, the model will direct the researcher to design an appropriate pedagogy model (***7Ms***) to provide support for ADHD children and help them overcome their academic limitations (see Chapter Four). As such, this clarifies the research questions raised in each section of the literature review and helps achieve the aim of the study:

'***To develop an appropriate teaching pedagogy for special educational needs (SEN) particularly children with ADHD, provide them support and help them overcome with their limitations***'.

Despite emphasising different types of educational pedagogies for special needs, the research questions show that few studies have been conducted on developing appropriate pedagogy for ADHD children; thereby indicating a significant research gap in the current study. To conclude, this literature chapter has contributed as below:

- Three pedagogy models of Merrill (2002), Ruitt *et al*., (2009), and Conole *et al*., (2004) have been considered.
- Other research on SEN with similar objectives of the current study has been covered.
- ADHD impairments and different challenges have been considered.
- Two ADHD models of Barkley (1997) and Brown (2005) have been discussed.
- The link between ADHD and designing pedagogy has been identified.

The following chapter examines the philosophy and methodological aspect of this research.

Chapter Three: Research Methodology

3. 1 Introduction

The literature review and model development illustrate the preliminary steps taken in the theory development in relation to academic performance for ADHD learners. Hereafter, this chapter discusses the methodological background of the current research and the rationale for conducting triangulation mixed qualitative and quantitative research methods. To achieve this, the chapter formulates the data collection methods step-by step, including the use of documents, (an online survey, interviewing four groups of experts, coaches, teachers, and parents, observations based on real classroom, and group discussion). This study has many dimensions that are essential to attaining a holistic perspective on the research issues. Accordingly, it was necessary to design a customised methodology of investigation in which the many different tasks could be achieved effectively within the constraints of the project. For instance, since the study involved issues relating to children with additional needs, specific measures were needed to be taken to safeguard their interests – ultimately, these constraints on the project meant that a decision was taken not to directly involve children as participants in the research, but instead to employ proxies to represent them (i.e. parents, teachers and other relevant professionals). However, in order to involve professionals it was necessary to extend the search for participants beyond the UK and notably to the USA. This was only possible by utilising the web and in particular social media on which many professional discussant groups were found and recruited for the research. Schools were of course critical to the study so suitable ones were approached in the London area with a view to participating in the study. Through the schools and also directly through other organisations willing parents were found.

The study can be partitioned along the lines of empirical and desk research elements. Because it is important that the outcomes of this study are evidence based, it was decided to rest considerably on empirical data, although, such data was in part from proxies. Each element demanded its own specific methods, so for instance, desk

research, which was based on an analysis of literature, depended on a solely rational approach distinct from any empirical input. This approach was suitable for analysis of current models and theories, and so was applied in the early stages of analysis in ADHD models and separately for pedagogy models. The second element was the empirical and this required involvement of real subjects from authentic situations. The study was interested in learning about their thoughts on the reasons for and effects of ADHD from their own perspectives. The intention was less on trying to establish a single representation of the idealised truth, and more on acknowledging differences and variation in perspectives among distinct groups of subjects as far as the ADHD component was concerned. In contrast, for the pedagogy component it was necessary to describe the authentic behaviour of teachers in the classroom, so suitable methods that involved observation supported by task modelling and interview were adopted. Admittedly, the purpose here was to move towards a common understanding of pedagogy, but this was so as to achieve a workable and practical tool to assist teachers in the workplace. Because the focus in the pedagogy component was more on professional behaviour rather than personal attitudes, the goals of the empirical work were different, and so too consequently, were the chosen methods.

3.2 Research questions

- What makes ADHD children different from typically developing learners? In other words, what are the specific ADHD impairments and advantages that might play significant roles in academic and social life contexts?

- How do different groups of ADHD experts, ADHD coaches, teachers, and parents consider ADHD with respect to learning?

- What are the differences between the perspectives of professionals and parents on ADHD strengths and impairments?

- What are the different roles taken by teachers in the classroom and how can different roles coordinate to help learners through different challenges?

- How can a suitable pedagogy be designed that can help ADHD learners with their academic achievements?

3.3 Aims and objectives

Recently, the use of a pedagogical approach in the field of education drawn considerable attention from the research community; however, few studies have been conducted that focus on the instructional design and pedagogical aspects relevant to children with ADHD. In this respect, the aim of this study is:

- To develop an appropriate teaching pedagogy model for special educational needs (SEN) learners, particularly children with ADHD that provides support and help to manage academic and social limitations.

At the start of the process, research objectives were identified to facilitate achieving the stated aim. These are described as follows:

- Determine pedagogical principles in order to develop a literature-based pedagogical model
- Evaluate the pedagogical model from which to develop a suitable pedagogy model for ADHD learners
- Develop an aetiological model of ADHD-associated determinants of learning from the perspective of multiple stakeholders
- Evaluate the aetiological model of ADHD
- Incorporate the aetiological model into a pedagogy model that will:
  (a) Aid the interpretation of ADHD signs in terms of specific learning needs; and
  (b) Enable the design of a specific pedagogy comprising appropriate didactic interventions
- Evaluate the ADHD pedagogical model.

3.4 Ontology, Epistemology, and methodological justifications

Ontology and Epistemology was derived from Greek as a reference to the theory and the science of knowledge (Goldman, 1999). Defining the ontology and epistemology pattern in the current research is significant since it directs the researcher towards appropriate answers to the research questions. Moreover, in order to ensure the consistency of this study, the research strategy supports ontology and epistemology stances followed by methodology in order to achieve the approaches. Since this study is a social research, the crucial attention of ontology is on critical realist, which focuses both on 'interpretivist' and 'positivist' philosophical approaches.

According to Remenyi *et al*., (1998, P35), an 'Interpretivist' method focuses on "*the details of the situation to understand the reality or perhaps a reality working behind them*", but, in fact, this approach emphasizes the value of qualitative data. Conversely, the positivist approach seeks to determine what is happening in the social world by examining consistencies and causal relationships between its components (Remenyi *et al*., 1998). According to Saunders *et al*., (2003), "*If your research philosophy reflects the principles of positivism then you will probably adopt the philosophical stance of the natural scientist*" (p.83). Based upon a natural scientist perspective, the researcher constructs theories that will illuminate an evident social reality by emphasizing structured, quantifiable observations, which will lead to the statistical analysis of a phenomenon's various components (Gill and Johnson, 2005). According to the research aim and objectives detailed previously, the philosophical stance in this study can be divided into four stages.

- **1st stage:** In the early stage of philosophical basics, ontological stance fits within the critical realism. A literature investigation of educational pedagogy directed the researcher towards a pedagogical model (***6Ms***). In this respect, the researcher performed a secondary data analysis as methodological approach in order to gain an in-depth understand of the pedagogy conception and different pedagogical principles introduced to date by other researchers. Therefore, epistemology of inductive is applied to building the ***6Ms*** model.

- **2nd stage:** After reaching a comprehensive understanding of pedagogy perception and its principles, the ***6Ms*** pedagogy model has been derived from the literature review. Hereafter, this stage aims to verify the ***6Ms*** pedagogy model in order to ascertain whether the model is applicable for the special needs children (ADHD). Further, the ontological stance in this stage likewise reflects the critical realism principles that aim to test deductively the specific model (epistemology), however the researcher assumes the pedagogical model may be *imperfect*. This approach requires qualitative methodological stance through classroom observations in order to provide an inclusive understanding of the difference in a real environment.

- **3rd stage:** According to the research objectives, one of the study's primary purposes is to develop an aetiological model of ADHD, representing the causal relationships between different impairments. Since this stage refers to the model development, the researcher aims to present a single realist ADHD model; however, the model may be *imperfect*. Similar to other stages, the ontological paradigm applied to the current stage is a critical realism seeking to determine events in the ADHD context (*ADHD symptoms*) and identify causal relationships; thereby clarifying the existence of one version of the knowledge through alternative perspectives, which are compatible. Deductive epistemological stance has been also applied in order to build the ADHD model. Thus, secondary data analysis is adopted at this stage in order to '*understand*' ADHD impairments at different levels (***L1:*** Cognitive, ***L2:*** Intermediate level, and ***L3:*** Observable signs) and '*assume*' its causal relationships through the literature investigation. Further, it is important to note that we cannot prove the model as a 'causal model'.

- **4th stage:** This final stage concentrates on model verification. Thus, the aetiological model developed through the literature review has been verified through the mixed methodological approach of qualitative including (semi-structured interviews and observations) and quantitative through questionnaire '*online survey*'. The ontological stance applied at this stage is also critical realism approach and an epistemology of deductive is followed to test the aetiological model of ADHD derived from the previous stage. In

this respect, researcher explains different versions of the knowledge yielded from four groups of experts, coaches, teachers, and parents. During this stage, the meaning was not presented automatically; hereafter, individuals develop their own understanding of their experiences. Accordingly, the researcher found that meanings in this study are varied and numerous, as four different groups with multiple views were involved in the interview and survey process. It is important to note that although four versions of ADHD model have been developed; all four models are compatible which represent similar objectives.

To conclude, researchers do not have immediate access to every aspect of the world; hence, there is a possibility of the failure or weakness of our knowledge (Bhaskar, 1975). This research project adopts a critical realism philosophical position, because it is presumed that access to actual understanding of human behavior is necessarily impeded by our abilities to directly perceive psychological states of the human mind. Therefore, observers will interpret observations in order to conclude about behavior and causality. There is the perception that agreement can be reached on such interpretations, in other words it may be possible to produce one or more models with respect to the phenomenon in question (i.e. ADHD). Although such models should be fundamentally consistent with one another, they may be at the same time heterogeneous with regards to surface qualities.

3.5 Research design and strategy

Research design is a general plan of how the researcher intends to answer a set of questions (Saunders *et al*., 2003). All, concerns on clear objectives that derived from research questions. Research design requires delineating the nature of the methodology of data collection to be applied.

Tasks have been referenced based on the Gantt chart outlining the research plan, which is provided in the appendix (A). Research plan **(I):** details of different stages from which to develop the pedagogy model (***6Ms***); Research plan **(II):** provide different tasks to the observation of ***6Ms*** pedagogy schema in order to verify the model; Research plan **(III):** details the tasks required to develop an aetiological model of ADHD (literature-based); Research plan **(IV):** explains the different stages

in order to verifiy the aetiological model of ADHD through interview; and finally, Research plan **(V):** indicates the model verification through the questionnaire (aetiological model of ADHD). References have been used in Figure 3-1 in two forms of 'task []' and the letter 'D' for task delivery order to provide the reader with a comprehensive understanding.

Figure 3-1: The research design

Context area	Designed ***7Ms*** Pedagogy model to teach ADHD children: ✓ Pedagogy concept and dimensions ✓ ADHD concept, impairments and strengths	
Philosophical basics	**Ontology**	**Epistemology**
1st stage	(Critical realism)	Inductive
2nd stage	(Critical realism)	Deductive
3rd stage	(Critical realism)	Inductive
4th stage	(Critical realism)	Deductive
	Conclusion: *According to the findings, ontological stance of this study has lied on critical realism approach.*	
Theoretical constructs	✓ **Pedagogy:** Learning theories, *e.g.* Constructivism (Piaget, 1957); pedagogy as a framework (Gore *et al*, 2004); Models of teaching styles (Bennett, 1988); mapping pedagogy (Conole *et al*., 2004); Merrill pedagogy (2002); Huitt *et al*., (2009), and Conole *et al*., 2004 [D1.6] ✓ **ADHD:** Barkley's model (1997); Brown's model (2005) [D3.2]	
Methodological approach	✓ Secondary data ✓ Qualitative method ✓ Quantitative method	
Sampling	**Convenience sampling:** tasks [4.2; 5.2] ✓ Purposive sampling applied for (Testing ADHD model: Quantitative approach) ✓ Snowball sampling plus purposive sampling applied for (Testing ADHD model) & (Testing 6Ms and 7Ms): (Qualitative approach)	
Trustworthiness criteria	✓ **Reliability** (Correct data collection and data analysis method through Cronbach's Alpha: Quantitative approach ✓ **Validity** (Meaningful and comprehensive results/conclusion through content validity, construct validity, and conclusion	

	validity): Quantitative approach ✓ **Credibility** (Correct data collection and analysis through triangulation method, prolonged engagement, member check: Qualitative approach task [5.4]
Data collection methods	✓ **Literature investigation** (Secondary data: building ***6Ms*** model and building ADHD model) tasks [1; 3] ✓ Online survey (testing ADHD model) [D4.1] ✓ Interview **×3** to the purpose of model verification on (ADHD model, ***6Ms***, ***7Ms***) [D5.1] ✓ Observation (testing ***6Ms***) task [2.1]
Data analysis techniques	✓ Quantitative analysis: SPSS (Mann Whitney Test, Correlation) [D4.4] ✓ Qualitative analysis: -Content analysis for (interview & observation) [D5.3.1] -Early stage of Grounded theory for (interview & observation [D5.3.2] *(Overall this section refers to the conclusion validity)*

Source: Developed for the purpose of this research

3.5.1 Methodological triangulation

According to the ontological, epistemological, and methodological stance discussed earlier, a triangulation approach is deemed appropriate for this study in terms of measuring interactions quantitatively and investigating phenomena qualitatively. Bryman (2006) states that this approach involves triangulating or employing more than one type of methodology. Moreover, Myers (2009) noted that triangulation is considered when the researcher plans to investigate from different angles; thereby, enabling a combination of qualitative and quantitative methods to be used in a particular study. Rossman and Wilson (1984; 1991), cited in (Miles and Humberman, 1994; p.41), highlighted three comprehensive reasons to link qualitative and quantitative methods:

"***(a)*** *To enable confirmation or corroboration of each other via triangulation;* ***(b)*** *to elaborate or develop analysis, providing richer detail; and* ***(c)*** *to initiate new lines of thinking through attention to surprises or paradoxes*".

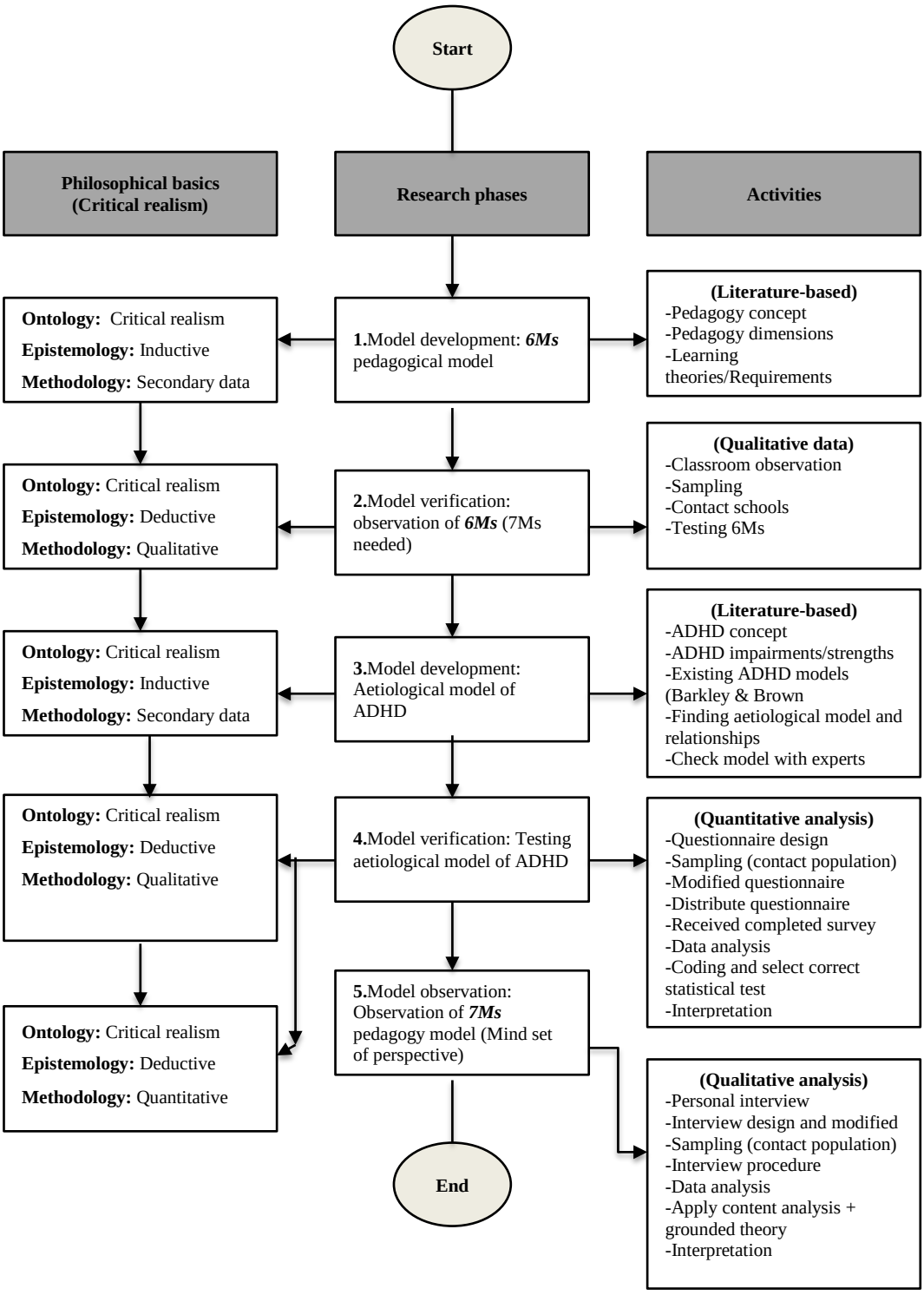
The reason the researcher has selected triangulation method can be attributed to the variety of data collection techniques used in this thesis. According to Tashakkori and Teddlie (2003), choosing a certain method is based on the research questions and the research approach. Consequently, in this study, the researcher utilised a mixture of methodologies, as presented in Figure 3-1. The quantitative section refers to the statistical analysis applied to the two groups of professionals and parents in order to verify the aetiological model of ADHD developed through the literature investigation. Conversely, the study employed mainly a qualitative method, including semi-structured interviews (one-to-one and group discussions) and observations. The decision to adopt qualitative data collections and analysis grew from the fact that this design is interested in insight, discovery and interpretation rather than hypothesis testing to examine human reality (Merriam, 2002). The qualitative study generated detailed rich information about the experiences of children with ADHD during the learning process. Different types of interviews with four groups of ADHD experts, teachers, ADHD coaches and parents have been conducted for qualitative data collection in order to focus more in-depth on the aetiological model of ADHD, as well as school practices, existing teaching methods and interventions.

Sequential research design allowed the researcher to develop the concept of educational pedagogy in a new setting (*i.e.* schools). In summary, the results of both the qualitative and quantitative studies, including school observations, semi-structured interviews and the questionnaire, are assimilated through the interpretation in Chapter 6.

3.6 Research process

In order to achieve to the aim of the study, this section details the research process in the form of a flowchart divided into three sections: philosophical basics, research process and activities (see Figure 3-2). The process includes five research phases justified by ontology, epistemology, methodology, and different activities.

Figure 3-2: The research process flowchart



Source: Developed for the purpose of this research

3.7 Ethical considerations

The maintenance of confidentiality throughout the research is of significant concern within the social sciences. It is necessary to focus on the importance of ethics in educational research; specifically, special education topics. Since this research is rooted in the special education context, ethical considerations are more complex in terms of contemplating effectively the principles required to overcome problems. Consequently, the researcher adhered to the following procedures:

- The researcher requested an enhanced Criminal Record Bureau (CRB) check via www.personnelchecks.co.uk and received the results after three weeks. This was required in order to enter to the special schools in London.
- The researcher completed the university ethics application and received ethical approval from the University (BBS) by email.
- Participants were informed that involvement in the study was totally voluntary and they were free to withdraw at any time.
- Participants were assured that their profiles would remain confidential for the entirety of the study. "*All information obtained as a result of their participation will be keeping confidential as legally as possible. In any publications that result from this research, no names will be identified*".
- The research aims and objectives were explained clearly before their participation.
- Nobody under the age of eighteen was involved directly in the research.
- Responsible adults were present at all times during classroom observations.
- Permission and agreement to conduct interviews and observations were obtained from the schools (see appendix F for ethics form).

3.8 Obstacles encountered while collecting the data

An obstacle was identified during the data collection procedure. At the very beginning, experts participating in this study had limited time for the long interview process; however, this was not a major issue. Once the researcher clarified the aim and objectives of the study, in addition to emailing published conference papers by the researcher: (Sajadi and Khan, 2011; Khan and Sajadi, 2012) to participants, most interviewees were interested in the study and provided an opportunity for a second

interview. This afforded the researcher the opportunity to cover all interview questions.

3.8.1 Access

There are a limited number of available ADHD experts and specialists in the UK. Therefore, the researcher had to make some connections with the USA through the ADD Coach Academy website. Membership was acquired for renowned support groups in both the UK (**ADDISS** and **Brighton adult ADHD support group**) and USA (**ADHD coach academy**), networking was conducted via social network-based systems (joining to several Facebook groups supporting ADHD children or adults; *i.e.* **attention talk radio**), while participating in different relevant conferences granted the researcher access to the communities of experts, researchers, coaches and ADHD diagnosed adults. This could assist the researcher in addressing simultaneously both the qualitative (interview, observation) and quantitative (online survey) phases of research. Below is brief description of the sources.

UK sources (ADHD support groups)

- ADDISS (www.addiss.co.uk) 'The National Attention Deficit Disorder Information and Support Services' aiming to deliver friendly assistance through resources about children with AD/HD, parents with AD/HD kids, teachers, or health professional.
- Attending to a couple of ADDISS conferences provided an opportunity for the researcher to meet other authors and experts in the field.
- Brighton adult ADHD support group (www.adhdbrighton.org.uk) offers support and improves ADHD awareness.

USA sources (ADD support group and Facebook group)

- ADD Coach Academy (www. addca.com) aiming to launching ADHD success.
- Attention Talk Radio (Facebook) (www.attentiontalkradio.com) aiming to support people who impacted by ADHD.

3.9 FIRST PHASE: Secondary data analysis

Secondary data analysis is the use of available textual data sets collected by other researchers in order to answer new research questions. This method is beneficial for researchers who are new to the topic in terms of generating applicable research questions that can be adapted to existing data. In this study, the secondary data sources used were focused mainly in two areas: pedagogy and special education, particularly ADHD. To date, a number of studies have been conducted on pedagogy and pedagogy dimensions (*e.g.* Bennett, 1988; Piaget, 1954). Focusing on educational pedagogy and different perspectives directed the researcher towards special education and ADHD. Moreover, a large volume of documents have been published (*e.g.* Barkley, 1997) on ADHD models.

Reputation of such sources by well-known researcher proving the validity and reliability of the secondary data used in this study. Conversely, DSM–IV (Diagnostic and Statistical Manual of Mental Disorders) published by APA (American Psychiatrist Association) provided valuable guidelines for ADHD. According to the aim of the study, the pedagogy schema for ADHD children has been developed with the intention of supporting children in overcoming their educational limitations. Therefore, the secondary data used in this study help researcher to establish first the '***6Ms*** Model' and second the 'aetiological Model of ADHD'. In this respect, different sources, such as books and journals published on the Internet, covered all necessary data required for this research (*e.g.* Schery and O'Conner, 1997; Brown, 2005; Barkley, 1997; 2003; 2006, and Fabio and Antonietti, 2012).

3.10 SECOND PHASE: Qualitative research

Denzin and Lincoln (2007, p.10) described the qualitative investigation focus in the following way:

"*The word qualitative implies an emphasis on the qualities of entities and on processes and meanings that are not experimentally examined or measured (if measured at all) in terms of quantity, amount, intensity, or frequency. Qualitative researchers stress the socially constructed nature of reality, the intimate relationship between the researcher and what is studied, and the situational constraints that shape inquiry*".

Since the present study is concerned primarily with the education sector, a qualitative research method is deemed appropriate in order to reflect real scenarios. Data sources used include semi-structured interviews conducted with four groups of ADHD experts, teachers, coaches and parents. Prior to the interviews, the researcher had to consider the following issues in relation to participation agreement: (Mile and Huberman, 1994)

- Time and effort required
- Types of data collection (interview; observation; questionnaire; note taking)
- Confidentiality and anonymity
- Role of participants
- Benefits to the participants and researcher

3.10.1 Qualitative data collection methods

Why use the personal interview technique?

Saunders *et al*., (2003) claim that interviews are helpful in terms of collecting reliable data that is relevant to the research questions and objectives. Since the research strategy includes exploratory factors, the researcher explored the possibility of conducting interviews during the early stage of qualitative data collection. Moreover, the participants were able to use the personal interview technique to overcome any misunderstanding and confusion they may have.

Bryman and Bell (2007) noted that qualitative interviewing is especially interesting from the participant's perspective. Interviews are particularly useful as they enable the researcher to ask complex, open-ended questions in order to investigate further the results yielded from the survey. The purpose of such questioning was to obtain more details about other ADHD impairments and strengths, as well as to identify the relationships between the impairments that place at different levels of cognitive deficit level (*L1*), internal effects (*L2)* and observable signs (*L3*). L1 refers to the cognitive performance of children with ADHD; L2 refers to the intermediate factors that lead to observable signs; and L3 refers to the impairments that can be realised clearly by the parents or teachers.

3.10.2 Semi-structured Interviews

Semi-structured interviews cover a list of various pre-prepared questions; however, some questions might be omitted in specific interviews (Saunders *et al*., 2003). By using such a list, the researcher is able to compare different responses; thereby generating additional qualitative data. The flexibility afforded by the semi-structured interview approach provided the opportunity to investigate a broad area in order to generate sufficient data. One of the significant themes considered when applying this method was derived mainly from the 'aetiological model of ADHD'. This model investigates how different people (experts, coaches, parents and teachers) understand the ADHD model. Moreover, teacher's interview proceed within three times to the purpose of verifying ADHD model, testing ***6Ms*** pedagogy model, and testing ***7Ms*** pedagogy model. The proposed questions have been checked by two ADHD experts prior to interview, so that any suggested modifications or revisions could be considered; thereby consolidating the validity of the questions.

The interview questions were designed, prepared, shaped, and conducted to fulfill research questions. Four different groups of ADHD experts, coaches, teachers and parents were selected to participate in the interviews; therefore, the researcher had to design four types of interview questions that were appropriate to each group (See Appendix B).

The participants were assured that the questions they would be asked were valuable and useful and that their responses will direct this research towards finding suitable teaching pedagogy for children with ADHD. Moreover, they were assured that details of their participation in the study would remain confidential. No identities will be revealed in any publications resulting from this research.

All interviews were pre-planned and arranged through telephone calls, emails and social networking (for example, Skype). Each interview session conducted via Skype and telephone were recorded digitally with the participants' agreement. Each face-to-face interview was approximately 40 minutes in duration, while the Skype sessions lasted 45 minutes for ADHD experts, coaches and specialists, and between 30 and 45 minutes for group discussion. Furthermore, using interviews to collect data provided the participants with the opportunity to raise any other issues relevant to the topic

that were not covered by the questions. The researcher was aware of the possibility of parental distress while talking about their child's condition; therefore, at the beginning of the interview, they were asked about their child's advantages and good experiences.

In conclusion, data collection and data analysis are a dynamic process, and both were applied simultaneously. As suggested by Bogdan and Biklen (1982), in order to conduct each interview, analytic questions were developed in advance, comments were noted and most interviews were recorded. Furthermore, the researcher noted what was learnt from each interview, tested thoughts, ideas and arguments on the subject, and explored the literature while producing data. In summary, the data sources in this section included: notes and recorded information from interviews with ADHD experts, coaches, parents and teachers.

3.10.2.1 Interview design

The use of open-ended questions provided opportunities for the interviewees to raise other important issues and encouraged them to provide extensive responses. With this in mind, the researcher used the aetiological model of ADHD followed by ***6Ms*** pedagogy model derived from the literature in order to design four types of interview questions. However, the researcher had to guide the interviewees' responses in order to cover main objectives of the questions. The programmes simplified the conversation in the following areas:

ADHD experts

- ADHD definitions and behavioural disorder
- Main challenges of ADHD
- Main difficulties at school and main learning difficulties
- Attention challenges and the reasons for inattentiveness
- Communication skills in ADHD and solutions to overcome difficulty
- Organisational skills in ADHD and solutions to overcome difficulty
- The important issues about ADHD

Coaches

- The importance of ADHD
- Main challenges of ADHD
- The impacts of inattentiveness
- The impacts of poor working memory
- Behavioural impairments
- Strengths of having ADHD

Parents

- Advantages of having ADHD
- ADHD definitions and their understanding of ADHD
- Main challenges for a child at school
- Being visual or verbal
- Coping with technology
- Educational strategies

Teachers

- ADHD behaviour
- Observable learning difficulties
- Information delivery method
- Being visual or verbal
- The use of technology
- Sequencing learning materials
- Different tools or educational strategies

Below are some examples of the open-ended questions used for each group (see Appendix B for the complete list of questions).

Q1. Can you explain *how* a child with ADHD might behave?

Q2. Can you explain *what* are the attention challenges of ADHD?

Q3. Can you please tell me *how* import is AD/HD?

Q4. Can you explain *what* are the impacts of poor working memory?

Q5. What strategies do you use to attract their attention to cope with attention deficit?

More importantly is how the interview questions are linked to the research objectives. As discussed frequently in this chapter, one of the main research objectives focused on model verification '*test the aetiological model of ADHD*' objective **(3)**. In this respect, the researcher aimed firstly to detail thoroughly the main challenges and impairments associated with ADHD children, as well as identifying the reasons for individual impairments. These form the components of the model; for example, in order to approach the research objective **(3)**, two types of questions are required to be answered by participants: first, questions to help researcher identify the components of the aetiological model and place them correctly; and second, questions to examine the relationships between the components. To highlight this, two example interview questions are provided below:

- "*What are the main challenges of ADHD?*" This question identifies different types of difficulties (cognitive, behavioural disorder), which form the components of aetiological model of ADHD.
- "*What are the impacts of poor working memory?"* This question determines the core impairments derived directly from poor memory skills (short-term, long-term).

Furthermore, another approach to the research objectives intended to '*test the **6Ms** pedagogy schema model*' objective **(2),** designed to deliver an applicable teaching pedagogy for children with ADHD. This provided a comprehensive understanding of existing teaching pedagogy used by experts, coaches, parents and teachers to help children and provide support for higher learning outcomes. In order to approach the research objective (2), an example question is provided below:

- *"How does s/he cope with technology (for example, computer, iPad, mobile, etc.)?"* This question identifies whether ADHD children have weaknesses or strengths in relation to engaging with technology (for example, multimedia technology learning). The answer will affect directly the pedagogy model of the study.

Consequently, the researcher planned to design four types of interview questions for four different populations with special roles in managing ADHD in order to contribute the research objectives.

3.10.3 Sampling

In this section, the researcher uses a combination of sampling methods, including purposive and snowball sampling, for use with a sample of ADHD experts, ADHD coaches, teachers and parents. Since the main data source is interviews, identifying a suitable interviewee and justifying the use of interviews are regarded as significant stages in the research. Therefore, purposive sampling seeks to classify participants according to the selected criteria that the research has concentrated (Lincoln and Guba, 1985). These include participants who are professional and experienced in the field of ADHD, either directly or indirectly. Moreover, the choice of participants was purpose-based since the participants play a significant role in terms of dealing with ADHD-diagnosed children. In addition to the purposive sampling, Saunders *et al*., (2009, p.147) highlighted that snowball sampling "*is commonly used when it is difficult to identify members of the desired population".*

In this respect, the researcher also applied snowball sampling to cover all critical participants that have direct involvement with ADHD, but were not easily identifiable by the researcher. Hence, the main participants were asked to introduce and recommend further experts to provide relevant information for this research. For instance, a UK ADHD support group has introduced the researcher to a clinical psychologist who also offers therapy to ADHD children. In contrast, one of the parents, who is a member of an ADHD support group in London, directed the researcher to another support group in Brighton. Therefore, some participants have been discovered through snowball sampling.

3.10.4 Profile of participants

Table 3-1: Profile of Interviewee

Interviewee	Position	Location	Duration of interview (Minutes)	Type of interview		Number of interviews
				Face to Face	Skype	
1	ADHD support group: [1]clinical psychologist	UK	40/35	✓		2
2	ADHD support group: [2] mental health therapist	UK	35	✓		1
3	ADHD support group: [3] professional ADD/ADHD	USA	30/25		✓	2
4	ADHD support group: [4] adult clinical psychologist	USA	45/35		✓	2
5	ADHD support group: [5] researcher on ADD/ODD/ADHD	USA	40/25		✓	2
6	ADHD support group: [6]clinical psychologist	USA	40/35		✓	2
7	ADHD support group: [7]researcher	UK	50	✓		1
8	Parent	UK	30	✓		1
9	Parent	UK	30	✓		1
10	Parent	UK	35	✓		1
11	Parent	UK	35	✓		1
12	Parent	UK	25	✓		1
13	ADHD coach: [8]coaching for mind, life coaching	USA	40		✓	1
14	ADHD coach: [9] E.T.A coaching	USA	35		✓	1
15	ADHD coach [10]	USA	35		✓	1
16	Assistant Head inclusion	UK	40	✓		1
17	Teacher	UK	35/30/30	✓		3
18	Teacher	UK	40/35/25	✓		3
19	Teacher	UK	30/25/30	✓		3
20	Teacher	UK	20/35/35	✓		3

Source: Developed for the purpose of this research

1 ADDISS support group
2 Brighton adult support group
3 ADD coach academy
4 Attention talk radio
5 ADD coach academy
6 ADD coach academy
7 Attention talk radio
8 ADD coach academy
9 ADD coach academy
10 ADD coach academy

Table 3-1 illustrates the profile of interviewees in both the UK and USA. The number of interviews conducted in some areas is presented two or three times, which signifies that either the first interview did not cover all the interview questions due to time constraints, or further questions were required according to the aims of the study. The following section presents the four groups of participants included in the interview process.

3.10.4.1 Descriptions

ADHD Experts

A total of seven people selected from ADHD support groups participated in the interviews. As presented in Table 3-1, the experts comprised a clinical psychologist, mental health therapist, professional ADHD/ADD and researcher on ADHD; all of whom have direct involvement with children and adults diagnosed with ADHD. Three participants were from the UK, and four participants were volunteers from the USA. Interviews in the UK were held on a one-to-one, face-to-face basis at the participant's place of work. However, interviews with US participants were conducted initially via Skype, and followed-up by telephone conversations. In addition, two informal sessions were held with ADHD charity members in London (ADDISS-non-profit organisation) and Brighton (Brighton adult ADHD support group), who are knowledgeable in the field. The advantages of these sessions were that they allowed a conversational and informal style of dialogue with teachers or coaches, who also happened to be parents of ADHD children. Furthermore, the researcher was able to attend a couple of social events that take place every two weeks in one of the ADHD support groups. Those attending the events were mostly specialists, teachers and coaches, parents of ADHD children and those with an ADHD diagnosis. Fascinatingly, the participants were interested in the result of this study; therefore, they were also preferred for further investigation.

ADHD coaches

Three individual interviews were conducted with volunteer coaches in the USA via Skype. ADHD coaches provide on-going support for patients in order to enhance an inclusive understanding of an ADHD diagnosis as well as the effect of impairments on the quality of their life. ADHD coaching focuses mainly on the specific

impairment for individuals and develops approaches that can boost the abilities of the ADHD brain. Moreover, the coach's role is to encourage and provide positive feedback and practical strategies with which to address different impairments. Conversely, ADHD coaching provides an opportunity to identify the strengths of ADHD and try to improve them and minimize the impairments. Taking these factors into consideration, all three coaches had direct involvement with ADHD people.

Parents

Five one-to-one, face-to-face interviews were held with parent volunteers selected from ADHD support groups. Interestingly, some parents themselves were also AD/HD sufferers. Since the parents were interested in the study, individual informal discussions have continued remotely through Skype and Facebook.

Teachers and Assistant Head Inclusion

Of the 20 interview participants, five were from two London special schools. Four volunteer teachers participated from one special school and an Assistant Head Inclusion from another. This selection was made based on the availability of teachers. Since the interviews were one-to-one and took place in the schools, the researcher had the opportunity to be in a real environment. However, there were two disadvantages to the school interviews: firstly, the interviews were disrupted by students and telephone calls; and secondly, there were limitations to setting an appropriate time. The Assistant Head Inclusion in each school decided which teachers should be interviewed based on their availability and the number of ADHD students in their classroom. Generally, the teachers who were selected were sufficiently experienced in working with different types of disorder (for example, dyslexia, autism, sensory disorder and ADHD, *etc*.). Moreover, their level of awareness of different ADHD types, behavioural problems and emotional, academic or social failure was clearly observable. With this respect, three interviews were conducted for the purpose of testing the ***6Ms*** model, verifying the ADHD model and testing the ***7Ms*** model in order to cover the research objectives.

3.11 Observation

Besides online questionnaires and interviewing, observations were also used to enhance the validity of the thesis results. The main purpose was to test the pedagogy model (***6Ms***) within a real environment (*stage 2*); derived from the literature review in the early stage of the research. The observational methods in this study provided great opportunities for the researcher to collect data from live situations, including communication and interaction. Cohen (2003) asserts that observational data collection enables researchers to recognise the real environment and observe things that might unconsciously be missed. In addition, unstructured observations could record many emerging actions and behaviours through interactions, as it is not restricted to specific settings within the social context (Bryman and Bell, 2007). Therefore, through observation, the researcher accessed the inclusive setting that provides the meanings of children with special needs, as well as observing the actions of teachers in an actual classroom environment.

Generally, observation is used in educational research as it delivers rich and bright contextual images to the researcher. In fact, observation is a strong research method that emphasises both individual and groups of participants. However, the study by Pring (2004) asserted that observations are clarified based upon the understandings, beliefs and preferences of the researcher in order to provide comprehensive explanations. At this stage, the main objectives of the researcher are rooted in existing educational strategies that are being used currently for special educational needs (SEN) in secondary schools.

3.11.1 The focus of the classroom observation

According to this study's approach, one secondary school has been selected from London's special schools. The school provides a service for different types of SEN, such as autism, sensory processing disorder, dyslexia and ADHD. The Head Inclusion Assistant of the school selected the participants from a range of teachers, classes, and students. This has been ended once the CRB check of the researcher has been approved. The researcher observed four different classrooms in total, all of which included one teacher and two teacher assistants who provide additional support to the teachers and the children. The number of students observed across the

different classes varied between five and eight. Hereafter, the researcher could sit with the students in the classroom; however, there was no individual interaction between the researcher and ADHD child. The teachers and teacher assistants told the students about the observations, but the procedure was non-interventional and the researcher did not interfere with the teaching process. The researcher was situated in a corner at the back of the classroom and observed teacher and teacher assistants, their teaching tools, ADHD students, their reaction to the learning materials, their social skills and attitudes between peers.

Based on the research approach, the researcher had a brief conversation with the teacher and teacher assistant before and after the lesson in order to collect appropriate information in relation to targeted children. The pre-observation conversation took around 10 minutes to identify the teacher's learning goals for children with learning disabilities and the teaching methods adopted to achieve these. The post-observation conversation took approximately 10 minutes and focused on the teacher's experience. The first classroom observation took 73 minutes; the second took around 58 minutes, the third took 50 minutes, and the fourth took around 52 minutes. Further details can be found in the observation sheets attached in Appendix C.

This section of the study has investigated the real educational pedagogies in place in a London secondary school; therefore, the observation procedure focused mainly on:

- Modelling teaching pedagogies
- The role of teachers and teacher assistants in the classroom (expert, coach, parent, teacher)

3.12 Content analysis

Miles and Huberman identified three parallel activities as a general data analysis technique: data reduction, data display and conclusion drawing/verification (1994), as outlined in Figure 3-3. Analysis for qualitative data applied *summative qualitative content analysis* (thematic approach and coding) based on the framework of the 'aetiological model of ADHD', which starts with the keywords followed by *early stage of grounded theory* to generate new codes, which will explain later in this chapter. Ryan and Bernard (2003) noted that themes represent the most fundamental

concepts to describe the subject matter of each area. The purpose of conducting content analysis in this research was to identify both explicit and implicit concepts through the data that contribute to the themes. Accordingly, the themes acknowledged by the researcher indicate the primary notions, arguments and expressions on which the research questions and hypotheses in this thesis are based.

Figure 3-3: Data Analysis Procedure

Authors	Data analysis procedure
Mile and Huberman (1994)	(1) Data reduction (3) Verification  (2) Data display -Focused on framework and research problems -Technique based on categorising/coding/themes

Source: Derived from Miles and Huberman (1994)

3.12.1 Data reduction

According to Miles and Huberman (1994; p.10):

"*Data reduction refers to the process of selecting, focusing, simplifying, abstracting, and transforming the data that appear in written-up field notes or transcriptions*".

This section began while data collection, summarising, and data coding was in process. The coding process and categorisation were based mainly on the themes and sub-themes that emerged from the model of the study. Making the decision to reduce data does not necessarily mean quantification. For this step, the researcher had to make a decision on central collected data during the transcription and coding process. Miles and Huberman (1994, p.11) have suggested several techniques for reducing data; for instance, "*Through selection, through summary or paraphrase, through being subsumed in a large pattern, and so on*".

The data reduction method has been applied to both content analysis and grounded theory. In order to operationalise data reduction in content analysis, the researcher had to finalise the conceptual model and review the main elements of the aetiological model of ADHD since the framework was the key factor in data reduction. This

approach helped the researcher to focus the research's core idea, main variables and concepts (Yin, 2009). Therefore, data was coded based upon the 'aetiological model of ADHD', as "*Conceptual frameworks and research questions are the best defense against overload*" (Mile and Huberman, 1994, p. 55). Consequently, according to the research questions, data were summarised and reduced in accordance with the research aims and objectives in order to yield better results. Conversely, for the grounded theory approach, once the qualitative data are summarised, new themes emerged based on the research questions; therefore, a new coding process has been applied for the purpose of reducing data.

3.12.2 Data display

As a second step in data analysis, a data display "*Is an organized, compressed assembly of information that permits conclusion drawing and action*" (Mile and Huberman, 1994, p.11). This refers to reassigning and re-organising the reduced data into an appropriate, meaningful categorisation; therefore, interview questions have been placed into the categorised table using an Excel spread sheet. Thereafter, the responses to the selected questions were displayed in a table based on themes. In this respect, the data display illustrates the relations and specific patterns between generated data. Overall, in this step, data will be reduced based upon the research questions in order to validate and certify the investigated relationships between the variables addressed clearly by the interview questions.

3.12.3 Conclusion-drawing verification

The aim of this section is to conclude all investigations through interpretation and explanation based on both the content analysis and grounded theory approach. However, according to Mile and Huberman (1994, p.11), this would not be the final step; "*Final conclusions may not be appear until data collection is over, depending on the size of the corpus of the field notes; the coding, storage, and retrieval methods used…*". Hence, conclusions are derived based on the final interview and observation through the empirical study. Table 3-2 below illustrates the procedure of content analysis for interview.

Table 3-2: The Procedure of Qualitative Content Analysis Used in this Study

The procedure	**Interview** (Based on aetiological model of ADHD)	**Observation** (Based on pedagogical model)
Data preparation	-Select the main interview questions -Transfer coding to the Excel sheet	-Select the main activities, actions, interactions, behaviours, and conversations
Define unit of analysis	-Individual themes -Searching for the expressions of an idea	
Develop categories / coding schema	-Coding generated from the framework (aetiological model of ADHD) -New coding generated through grounded theory	-Coding generated from pedagogical model -New coding generated from observation
Test coding schema	-Checking the sample of text for coding -Revise coding and check the coding consistency	
Coding all the text	-Adding new themes to coding manually	
Assess the coding consistency	-Checking for reliability since the human coding have been applied through re-check coding several times by the researcher and the colleague	
Draw conclusion	-Identify relationships within categories	

Source: Adapted from Zhang and Wildemuth (2010)

3.13 Grounded theory

According to Strauss and Corbin (1992):

"*Grounded theory is a general methodology for developing theory that is grounded in data systematically gathered and analyzed. Theory evolves during actual research, and it does this through continuous interplay between analysis and data collection*" (p.273). It is significant to consider that the findings from grounded theory are the development of a theory from which new coding is derived. This study also used early stage of grounded theory in order to identify new codes emerging from collected data (ADHD model). Consequently, grounded theory approach is applied to the interview stage in order to discover new ideas or concepts that have not been investigated through interview questions. Table 3-3 below explains the three stages of data analysis based on grounded theory.

Table 3-3: The Procedure of Grounded Theory Analysis Used in this Study

The procedure	Description
Open coding	-Selecting and naming categories from data analysis (for example, dual diagnosis, overlap with autism) -Labeling variables (for example, Co-morbidity)
Axial coding	-Identify causal relations between categories from the previous stage in a way to comprehend the phenomenon (for example, Interventions)
Selective coding	-Validating the causal relationships derived from the categories (theory development from the core categories)

Resource: Strauss and Corbin (1992)

3.14 THIRD PHASE: Quantitative research

As mentioned in section 3.5, the third phase of the study involved conducting a quantitative research. Generally, quantitative data are required to collect data from a large sample. According to the secondary data explained in the earlier section, the researcher has developed an aetiological model of ADHD; hereafter, this phase aims to verify the model of ADHD. Therefore, a questionnaire has been distributed and completed by two different groups of participants: ADHD professionals and parents of children with ADHD who play vital role. This would generate data necessary to develop an analysis of the relationship between various specific variables. These include ADHD impairments and their associations, as well as ADHD strengths and their causal effects. The quantitative data had the potential to designate statistically two significant criteria from questioning the participants:

(a) *The level of agreement on the ADHD impairments as well as the reasons behind the difficulties, and*
(b) *The level of agreement on ADHD strengths*

3.14.1 Sampling

The population of the quantitative study was based on convenience sampling. The technique used here was purposive sampling, due to the small sample size (67 participants) including professionals and parents, convenience of an accessible sample population, time restrictions and cost implications for the researcher.

Tashakkori and Teddie claimed that "*purposive or non-probability samples in which the researcher uses some criterion or purpose to replace the principles of canceled random errors …researchers using purposive sampling seek to focus and, where practical, minimize the sample size, generally in non-random ways, so as to select only those cases might best illuminate and test the hypothesis of the research*…" (2003; p.279). As explained in section 3.8.1, those who participated in the online survey comprised mainly professionals selected from members of the ADDISS organisation, ADD Coach Academy and expert members from attention talk radio. In order to clarify the qualifications of the professionals, participants had to indicate their status in the questionnaire. Professionals included the researcher, an author in the field ADHD, a specialist on ADHD, clinical psychologist or psychiatrist and ADHD coaches. Moreover, parents from both the ADDISS and Brighton UK support groups combined the main respondents to the online questionnaire. Of the 67 participants, 25 are parents and 42 have a professional role. Two groups of participants became the focal point for the researcher due to the significant role they play in monitoring children's attitude. To conclude, the population involved in this phase of the study was supportive and interested in the results of the survey.

3.14.2 Online survey

Numerous researchers have claimed that online data collection methods have become progressively more attractive (*e.g.* Bryman and Bell, 2007; Schonlau *et al*., 2001). Schaefer and Dillman (1998) and Mehta and Sivadas (1995) explained the main advantages of online surveys as a low-cost method of sending out emails and receiving fast responses; thereby, yielding potentially higher responses rates than a mail survey. The researcher contacted participants in the UK and USA by browsing individual websites to obtain contact details, including email, telephone and postal address. Since the ADHD support groups also include professionals and parents, the researcher also tried to connect with parents.

In order to raise professional and parental participation in the online survey, the researcher contacted the remaining support group members that were yet to respond. Surprisingly, response to the survey was very fast since the researcher received several emails demonstrating that participants were interested in, and waiting for the results.

The survey was designed through survey monkey (www.surveymonkey.net), allowing the researcher to collect the responses, analyse results by filtering responses and download responses in order to store the data. The survey remained online between 01 September 2011 and 30 November 2011.

3.14.2.1 Questionnaire design

The questions were derived mainly from Russell Barkley's work (2003), DSM-IV (Diagnostic and Statistical Manual of Mental disorder) criteria for ADHD based on AAP (American Academy of Pediatrics, 2004). Importantly, this questionnaire relates to the ADHD model aiming to verify the aetiological model of ADHD. The questionnaire was subsequently checked and modified by experts in order to enhance its validity. The questionnaire began with a covering to identify clearly the purpose of the survey, and ended by clarifying the researcher's intentions for the completed version of questionnaire. Hereafter, the survey is divided in three central sections, including personal information, ADHD impairments and ADHD strengths.

- *Section one: personal information*

  The purpose of section one was to categorise the status of participants (*i.e.* ADHD support groups/charity, specialist/researcher, psychologist/psychiatrist, parent/carer or teacher/ADHD coach), their level of experiences with AD/HD children/adolescents (beginner, knowledgeable and expert) and whether they have direct involvement with ADHD children/adolescents, which will add more validity and reliability to the questionnaire results. Data types used in section one were categorical (independent variables).

- *Section two: ADHD impairments*

  The second section of the questionnaire aimed to investigate ADHD impairments and identify different ADHD impairments and their causal relationships. Likert-style questions were used for a series of statements. Saunders *et al*., 2003 stated that "*Rating or scale questions are often used to collect opinion data. The most common approach is the Likert-style rating scale in which you ask the respondent how strongly they agree or disagree*

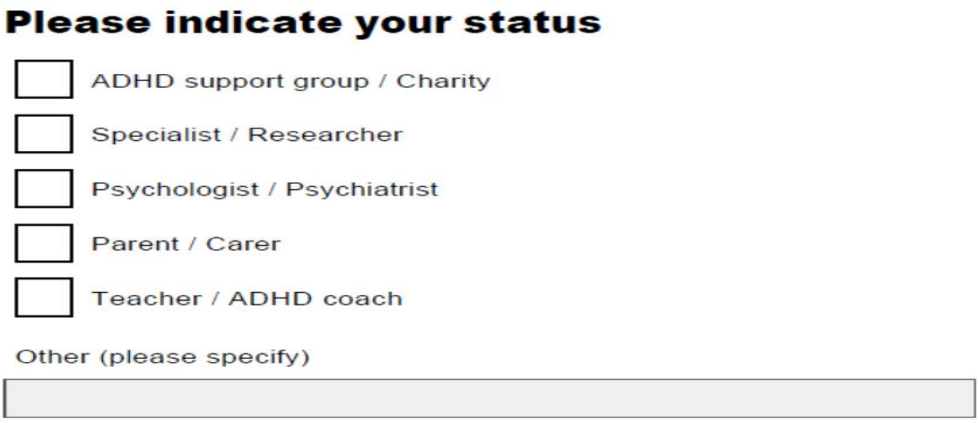
with a statement or series of statements" (p.296). Data types used in this section were either interval or ordinal. Thus, the purpose of using dependent variables was to observe the relationships between them. The researcher intended to use parametric testing in order to analyse data sets. In some cases, the researcher combined a set of relevant statements (three or more) to create real numeric data (Interval), as this adds validity and reliability to the results. For the purpose of this research, combining the more relevant statements (*i.e.* attention) increased the reliability and validity of the results. In contrast, some cases required measuring individually the position of each statement in data set (Ordinal). In this case, there was no need to combine a series of statements.

- *Section three: ADHD strengths*

  Finally, section three aimed to examine possible ADHD strengths. Similarly, this section also includes Likert-style questions followed by open-ended questions aiming to receive individual answers. Data types used in this section were either interval or ordinal. The codes allocated to responses are as follows: strongly agree/highly likely (5); agree/likely (4); neutral (3); disagree/unlikely (2); strongly disagree/highly unlikely (1).

According to the research objectives stated previously, the questionnaire findings would contribute to the model verification (to verify the aetiological model of ADHD) derived from the literature review. Therefore, the existence of individual ADHD impairments (*e.g.* attention, emotion, impulsivity, *etc.*) followed by the verification of relationships between impairments (*e.g.* what symptoms leads to poor knowledge integration among ADHD children) must be approved by the responses given from two groups: ADHD professionals and parents. Therefore, this variation on clarification and verification of the aetiological model of ADHD required different question types and data types (categorical, interval, and ordinal). Some examples of questions are provided below (see the appendix D for the complete survey).

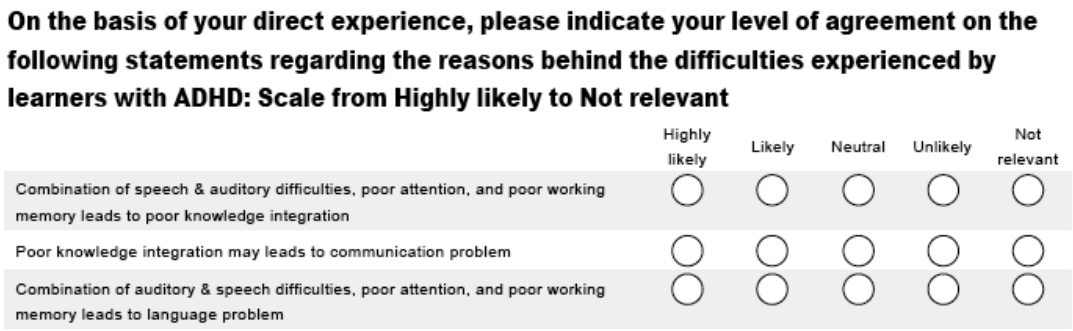
Q1:



Data types: (Categorical)

Purpose of the question: This question aimed to distinguish the sample population between ADHD professionals who participated in the online survey, in order to categorise them into five different groups: ADHD support group/charity, specialist/researcher, psychologist/psychiatrist, parent/carer and teacher/ADHD coaches. The reason for selected such a range of participants is because wide research has proved repeatedly the critical role of theses samples on both ADHD's academic performance and social life. Therefore, this is beneficial to the reliability of the questionnaire results.

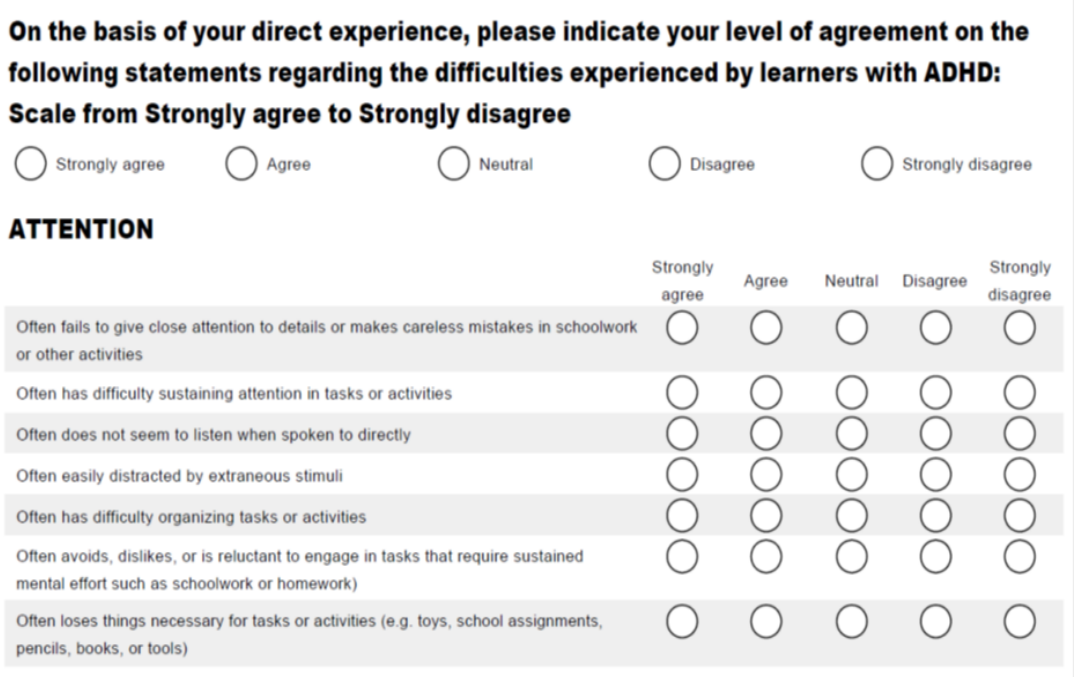
Q2:



Data types: (Ordinal)

Purpose of the question: This question aimed to identify relationships between a numbers of impairments that emerged from the literature review. Each statement explores independently the effects of one or more symptoms that lead to impairment. This was because every statement was settled separately from other statements (irrelevant); therefore, it must be analysed separately. Therefore, data types used in this question were ordinal in order to measure individually the view of each statement in the data sets.

Q3:



On the basis of your direct experience, please indicate your level of agreement on the following statements regarding the difficulties experienced by learners with ADHD: Scale from Strongly agree to Strongly disagree

◯ Strongly agree ◯ Agree ◯ Neutral ◯ Disagree ◯ Strongly disagree

ATTENTION

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Often fails to give close attention to details or makes careless mistakes in schoolwork or other activities	◯	◯	◯	◯	◯
Often has difficulty sustaining attention in tasks or activities	◯	◯	◯	◯	◯
Often does not seem to listen when spoken to directly	◯	◯	◯	◯	◯
Often easily distracted by extraneous stimuli	◯	◯	◯	◯	◯
Often has difficulty organizing tasks or activities	◯	◯	◯	◯	◯
Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort such as schoolwork or homework)	◯	◯	◯	◯	◯
Often loses things necessary for tasks or activities (e.g. toys, school assignments, pencils, books, or tools)	◯	◯	◯	◯	◯

Data types: (Interval)

Purpose of the question: In contrast to *Q2*, this question intended to focus on series of related statements (attention). This question also aimed to identify symptoms of attention skills in ADHD. Since all questions belong to one impairment category (*e.g.* attention); therefore, the researcher allowed a combined set of seven relevant statements in order to increase the validity and reliability of the results. Therefore, this was summed into a total for use as interval scale data.

3.14.3 Data analysis techniques

Descriptive statistics were produced with the assistance of SPSS 18.02, one of the popular programmes within the field of social-science study (Dogan, 2009). The programme provides the researcher with the opportunity to analyse data quickly through different tests. In relation to coding data, all responses were systematised before being transferred into the SPSS software for analysis. The first step is to transfer all data to the Excel spreadsheet, depending on the type of response code provided. Therefore, for the status of each participant, the response was coded as follows: ADHD professional (1) and parent (2). Conversely, codes for the level of agreement on statements were as follows: strongly agree/highly likely (5); agree/likely (4); neutral (3); disagree/unlikely (2); strongly disagree/highly unlikely (1).

The next step was to transfer all data collected in the Excel spreadsheet to the SPSS programme. Hereafter, the next step was to identify any errors that may mislead the data findings. Therefore, all data had to be checked manually by re-reading and making comparisons with the original data. As explained in the previous section, three types of data were introduced: categorical, interval, and ordinal. During the first stage of analysis, two independent variables (Professional: 1 and Parent: 2) have been tested when the dependent variables were interval. However, during the second stage of analysis, two independent variables of (Professional: 1 and Parent: 2) were tested when the dependent variables were ordinal. Moreover, normality was tested by inspecting the Shapiro-Wilk statistic. Since the sig value in Shapiro-Wilk Test was less than 0.05, data were not reasonably normal distributed.

Consequently, the researcher decided to apply Non-parametric testing; namely, the Man Whitney Test and Correlation Test, which are applied to quantitative data set. The Man Whitney Test identified any significant differences between the professional group and the parent group in terms of the responses of dependent variables for both cases (when dependent variables are interval or ordinal). In addition, the Spearman's Rank-Based Correlation Test was applied to establish whether any relationships exist between variables. Table 3-4 below illustrates a small sample of SPSS data analysis.

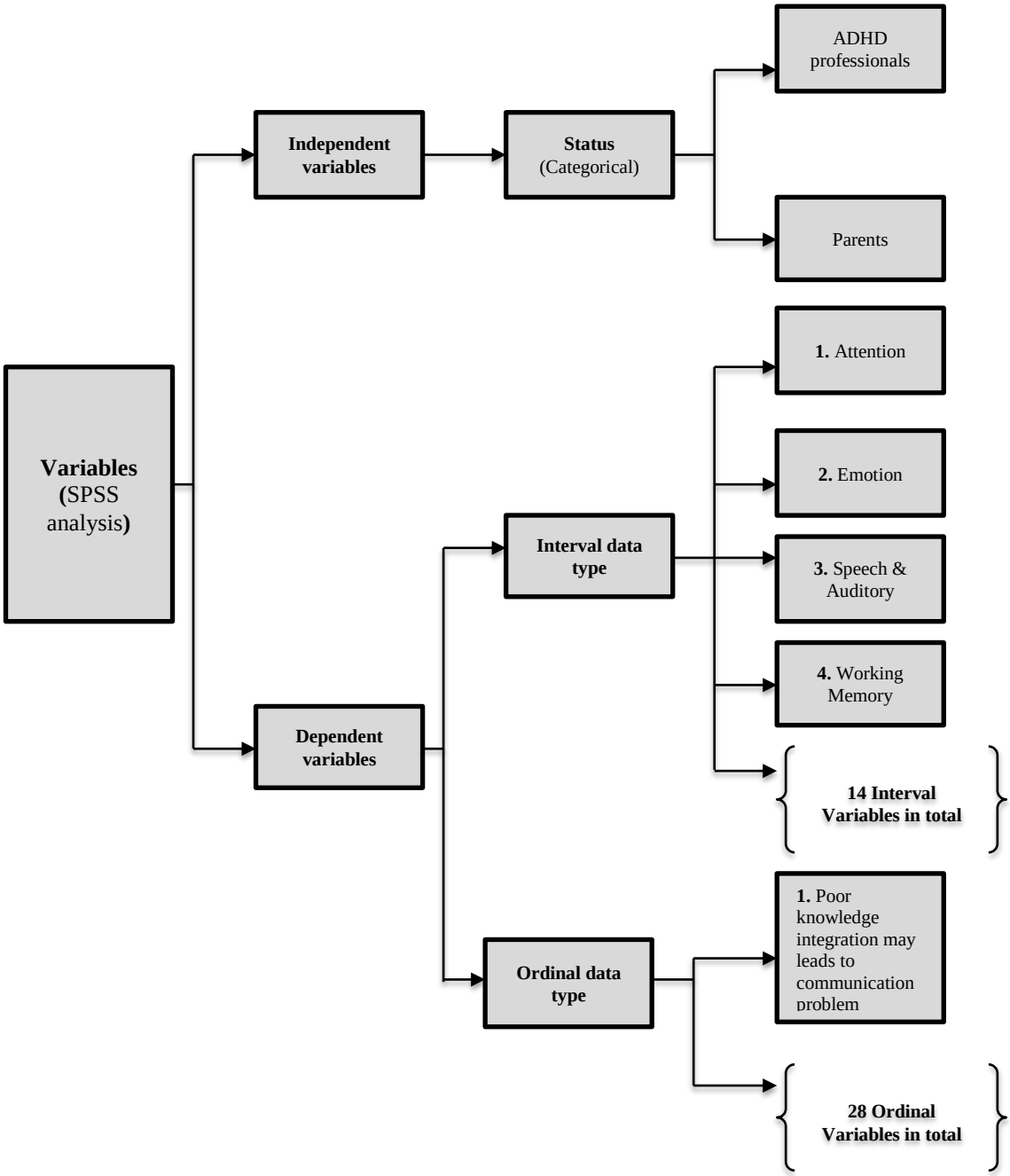
Table 3-4: Sample Section of SPSS

Name	**Variable: Dependent/Independent**	**Data type**
Status	Independent	Categorical
Attention	Dependent	Interval
Emotion	Dependent	Interval
Distraction leads to lack of focus	Dependent	Ordinal
Memory	Dependent	Interval
Impulsivity	Dependent	Interval

Source: Developed base on SPSS analysis

Figure 3-4 below differentiates between dependent and independent variables in quantitative data analysis in relation to the questionnaire and displays the link between the different variables.

Figure 3-4: Structure Questionnaire



Source: Developed for the purpose of this study

3.15 Trustworthiness

Robson (2011), cited in Petty *et al*., (2012), states:

"*Trustworthiness refers to the confidence or trust one can have of a study and its findings and is determined by those assessing a study*" (p.381).

The analysis procedure and the validity of the results must be defined sufficiently to enable the reader to form a clear view of how the analysis was conducted, in addition to its advantages and limitations. The value of this research is significant in that it increases the reliability and validity of the study whereby it is necessary to establish a link between the study's output and the data. Therefore, the researcher has to report in depth all analysis procedures. In this research, the researcher used methodological triangulation; hence, the concepts of validity and reliability in qualitative and quantitative research are considered differently. In other words, the terms used for trustworthiness in quantitative research may not be applicable to qualitative research. Table 5-5 illustrates precisely the trustworthiness features according to Lincoln and Guba (1985).

3.15.1 Reliability

In statistical measurement, reliability refers to the elements of errors (Muijus, 2011). Reliability focuses on assuring correct data collection methods (procedure) that yield consistent results. Unreliability in research may lead to untrustworthy findings. In fact, reliability presents the extent to which the results are truthful and whether they can be repeated based on similar methodology. The idea here is to reassure the repeatability and reliability of the results. To ensure the reliability and repeatability of quantitative research, reliability analysis has been classified into three types: reliability as stability, which refers to testing and retesting over time; reliability as equivalence, which may be achieved using alternative instruments; and reliability as internal consistency, which refers to the homogeneity of items (Cohen *et al*., 2007).

In this study, the researcher conducted internal-consistency reliability to suggest how different factors measure the same variable. In order to test the internal consistency, Cronbach's alpha coefficients (α) were stated (Cronbach, 1984). Since the online survey conducted here includes multiple Likert-scale questions, Cronbach's alpha is the most frequently used to measure reliability. In general, greater than 0.70 is contributed to the reasonable reliability for research purposes (Muijus, 2011).

Furthermore, reliability coefficients (Cronbach's alpha coefficients (α)) were considered for both dependent and independent variables in order to deliver an internal consistency reliability assessment of test scores. The calculated Cronbach's alpha coefficients in this quantitative study established a high internal consistency estimate of the scores' reliability.

3.15.2 Validity

In quantitative research, the discussions of validity have been repeated frequently and its importance has been identified and accepted as an essential key to effective study. Creswell and Plano Clark (2008) stated that validity refers to drawing meaningful and comprehensive conclusions. Validity delineates ***whether the research is actually measuring what it was intended to be measured.*** In fact, in order to assure the accuracy of the measurement conducted, three types of validity must be considered, including content, construct and conclusion validity (Muijus, 2011). These assessments are applied in order to check whether or not the questions of the online survey are appropriate to measure "ADHD impairments, causal relationships between impairments, and ADHD strengths".

- ***Content validity***

  Content validity as a formal review is associated clearly with the knowledge and theoretical background of the study. In this respect, the researcher tried to improve the questionnaire by asking ADHD professionals for their opinions on the content of the instrument. Experts assess content validity as "*the plan and the procedures used in constructing the instrument*" (Creswell, 2008; p.172). The steps explained above were followed in order to determine the truthfulness of the data measured through the online survey instrument. Conversely, in order to obtain genuine results, careful sampling (purposive sampling of professionals and parents in the field of ADHD) has been considered to address the validity of the findings.

- ***Construct validity***

  Construct validity has been used in this study to examine how well the researcher interpreted the impression and theoretical background of study into real measures. This is vital since it requires the researcher to

communicate using words to clarify related concepts or constructs. Therefore, in this study, construct validity aimed to illuminate how the researcher confirmed that the questionnaires and interviews were actually collecting data relating to the target constructs. To evaluate whether any pair of measures are correlated together, the researcher applied the correlation coefficient. Interestingly, the Correlation Test (*statistical analysis*) represents the degree of interrelations between all constructs (*e.g.* attention, emotion, impulsivity, *etc.*).

- ***Conclusion validity***

  1. Conclusion validity refers to ***the data analysis***, which explains whether or not there is a positive relationship within the study's data. In fact, conclusion validity in quantitative analysis refers to the statistical conclusion. As explained in section 3.14.2.1, the researcher intended to apply Parametric Testing in order to analyse the data. Accordingly, this could present a ***threat*** to conclusion validity since, when normality testing is applied to the raw data in order to check the normal distribution of data, results illustrate that all data were **not** reasonably normally distributed. Therefore, the threats might refer to incorrect statistical testing followed by gaining a false estimation of the relationships between constructs. Therefore, the researcher had to apply Non-Parametric Testing due to the small sample size (n=52). Consequently, conclusion validity explains whether the choice of statistical test (Non-Parametric Test) was correct. In fact, it is important to note that the relationship found between constructs influence the research results (ADHD impairments: *i.e.* attention, emotion, speech, *etc.)*; thereby, representing the strength of the study's conclusion. In this respect, the Correlation Test applied between constructs illustrates a noticeable relationship between the variables.

  In statistical analysis, the researcher seeks to determine whether the findings or 'relationships' between constructs are real or by chance. This is one of the other ***threats*** to conclusion validity. In this data analysis, correlation is significant at 0.01; therefore, the strengths are measured as follows:

0.2 < R < 0.4	Weak
0.4 < R < 0.6	Moderate
0.6 < R	Strong

Overall, in order to develop conclusion validity, more relevant information needs to be collected and a larger sample size used in order to reduce the risk of error.

2. The second conclusion validity considered in this research was qualitative data analysis. '*Why choose qualitative content analysis method*?' As explained earlier in this chapter, content analysis is defined as a systematic, powerful and replicable technique for analysing textual data that has been used widely by researchers. This method has been applied since the researcher has sought in-depth investigation into the meanings. Moreover, of what significance is the ***threat*** to trustworthiness in coding and appropriate themes? The reliability of a content analysis study discusses its stability for coders in order to constantly re-coding the same textual data. Therefore, codes and categories have been checked with other experts, and similar codes were achieved.

3.15.3 Credibility

According to Bryman and Bell (2007), credibility criteria in qualitative investigation match validity criteria in quantitative investigation. Thus, they noted that this approach could be attained by "*ensuring that the research is carried out according to the canons of good practice and submitting research findings to the members of the social world who were studied for confirmation that the investigator has correctly understood that social world*" (p.411). Therefore, three methods were used to assure the research credibility, including: triangulation method, prolonged engagement and member checks.

Using triangulation method

As discussed frequently throughout this research, the triangulation method has been used to approach the study from different angels. The most common triangulation methodology comprises two types: between methods and within methods. For the purpose of this study, both types have been utilised. The between methods approach refers to qualitative data using semi-structured interviews and observation. However, within methods, the researcher combined qualitative and quantitative (online survey) means in order to address the research validity.

Prolonged engagement

The researcher spent adequate time (approximately 18 months) learning about the phenomenon within the real environment; thereby, enabling the researcher to form worthy relationships and build trust with the participants. The advantage to this was that the researcher could make a good connection with those involved via social networking (*i.e.* Facebook), thus instigating a prolonged engagement with the participants.

Member checks

This method provided opportunities for the researcher to re-check and clarify data collected in order to achieve reliability and validity. In fact, this method can be used simultaneously while data is being collected. Therefore, it could be an effective technique for approving collected data prior to embarking on the next stage of the research. Hence, the researcher emailed summaries of the interviews to a member of the participant groups for confirmation. Connecting beforehand with some of the participants enabled the researcher to make such a request.

3.15.4 Dependability

Dependability requires certifying that reliability principles, philosophical and theoretical explanations and the research progression are all reliable, consistent and accessible for review (Guba and Lincoln, 1985). Therefore, all research procedures have been documented to ensure that, by following similar procedures of data collection and analysis, similar findings would be yielded.

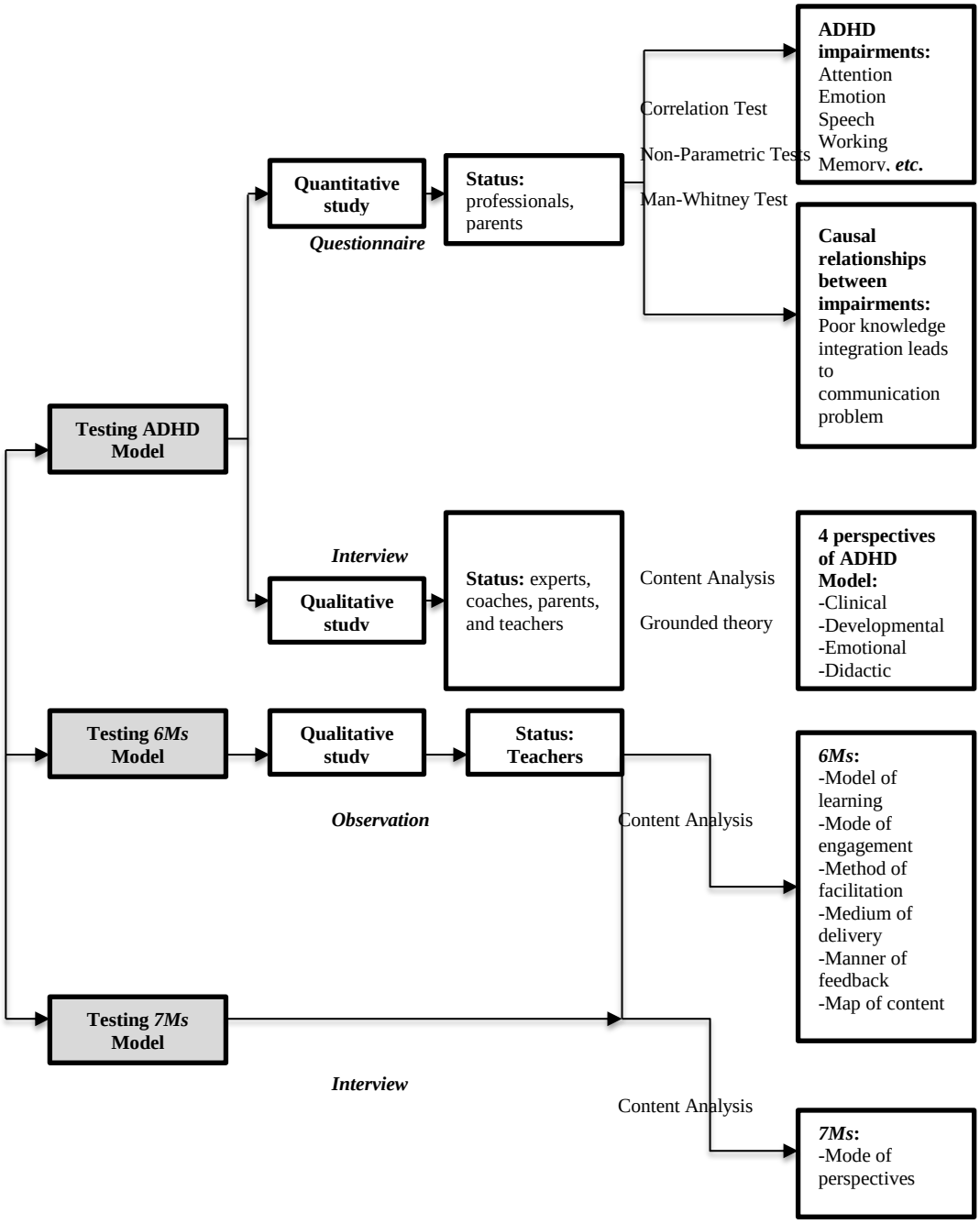
Table 3-5: Trustworthiness

Trustworthiness Features	Description	Methods applied for the purpose of this research
Reliability	Gain similar results, if the study repeated in similar context, with same methods and participants	- **Measurements in quantitative method:** Internal consistency reliability (Cronbach's alpha coefficients (α) - **Measurements in qualitative method:** coders and the agreement on codes
Validity	Whether the research is actually measuring what it intended	- **Validity in quantitative method:** Content validity, construct validity, and conclusion validity
Credibility (In qualitative study)	To certify the accuracy of the results and justifications through valid principles	- **Using triangulation method** (qualitative data using interview and observation vs. quantitative using questionnaire) - **Prolonged engagement:** (18 month investigation in a real environment to understand the phenomenon) - **Member checks** (confirmation of data) (*Bryman and Bell, 2007*)
Dependability (In qualitative study)	To assure and maximize the reliability and consistency of the study	- **To audit:** Documented all interviews, observations, and analysis procedure in digital format in order to address the study is reliable

Source: Developed for the purpose of this research

3.16 Research Model

Figure 3-5: The architecture of study



Source: Developed for the purpose of this research

3.17 Conclusions

In this chapter, the researcher has discussed and justified the research methodology adopted for this study. The primary conclusion is mixed of qualitative and quantitative paradigm that matches the researcher's viewpoint of approaching an investigation from different angles. Moreover, the researcher has reached the following conclusions regarding how the different models were integrated and supported:

- The researcher examined both techniques of quantitative and qualitative data analysis
- The literature analysis applied a qualitative study only in order to develop an aetiological model of ADHD/pedagogical model
- Mixed methods of quantitative and qualitative were used to test an aetiological model of ADHD
- Qualitative study only was used for observations in order to test the pedagogical model in a real environment,

Further conclusions are explained below:

- Ethical issues were found to be significant; principally, when the research explored Special Educational Needs
- The need of trustworthiness strategies to increase the reliability and validity of the study

The following chapter in this thesis discusses the data analysis of the study, including three phases of 'secondary data', 'qualitative analysis' and 'quantitative analysis'.

Chapter Four: Data collection / Analysis / Findings: Part one

4.1 Section 1: Pedagogy Model (*6Ms*)

In this section there is a reflection on the literature review explained earlier about pedagogy. Bennett (1988) asserts, "*Empirical studies of teaching style began in 1960s and continued for a decade*" (P.20). Research on teaching strategies pays more attention on the significance of instructional practices as a fundamental to learners' academic success. As explained in the literature, number of pedagogy models are closely linked with particular learning theories (*e.g.* Shieh, 2012) in which has strong implications on teachers' educational pedagogy. In addition, existence of technology such as computers or different programs in schools may direct pedagogy model into a learning theory-centered pedagogy approach through computer and /or online learning environment (*e.g.* Rovai, 2004). A consequence of such model '*a constructivist-technology oriented model*' suggests a sample of pedagogy model development. Accordingly, researchers' investigation illustrates that pedagogical strategies require understanding different aspects of teaching process. Although numerous studies have been conducted on designing educational pedagogy, they simply have considered on e-learning pedagogies (*e.g.* Kolb, 1984). However, when instructors designing courses '*didactic view*', a range of different core factors carefully need to be reflected in order to make decisions of different educational choices. Overall, in this study the researcher aimed to bridge the gap that exists between individual learner and pedagogical criteria to support teacher designing lesson plans.

The researcher therefore has developed a conception of Pedagogy, which is a combination of several *criteria* in order to design special instruction appropriate for children with special educational needs (SEN), particularly ADHD. Accordingly, the primary concern of the researcher in this subchapter was to highlight design the ***6Ms*** pedagogy schema. Hence, two central questions have been raised as follow:

Q1: *What makes suitable instruction for ADHD learners?*
Q2: *How ADHD children can learn the content and learning materials?*

Pedagogy is considered to be a product that emerges from decisions taken about several factors of learning. Each of these dimensions has two or more alternatives from which the most suitable option may be selected. To design a particular pedagogy, therefore, requires that the designer visit each criterion in turn and commit to a specific option. Each pedagogy criterion is initiated with the letter 'M', which has emerged conveniently to form a useful mnemonic for the schema. The criteria in question are identified and discussed below as a ***6Ms***.

Criteria = { ***M****odel of Learning,*
M*ode of Engagement,*
M*ethod of Facilitation,*
M*anner of Feedback,*
M*edium of Delivery,*
M*ap of Content*
}

4.1.1 Criterion 1: Model of Learning

The term 'learning' can refer to acquiring new information, skills and behaviour or adapting existing knowledge in the working memory (Anderson, 1996). This definition plays significant role in this research. Furthermore, learning or gaining knowledge is unique to each learner. Learning theory involves principles to explain the circle of changes in human learning performance, through which we can observe how learning occurs. Since a huge part of the literature on pedagogy has been allocated to learning theories, the researcher decided to investigate different human learning theories that have had significant influences on education. In education and psychology a model of learning or alternatively learning theory is defined as a description of how learning takes place in people. In fact, todays' teaching strategies and interventions for both typically developing learners (TDLs) and special educational needs' instructors (SEN) are based on different psychological learning

theories (Garcia and Pacheco, 2010; Martín-del-Campo, 2010; Shieh, 2012). Since it is hard to irrefutably prove a learning theory, the researcher prefer to adopt the term '*model of learning*' since it connotes that idea that the process is a conjectured description rather than a universally accepted explanation of the internal workings of the human mind. However, the term learning theory will be used interchangeably with model of learning to remain consistent with the general literature. Selection of *suitable learning theory* is a fundamental determinant of pedagogy, and differences on the basis of learning theory are sufficient for differentiating among competing pedagogies.

4.1.1.1 Behaviorism

The concept of behaviourism refers to the school of psychology founded by John B. Watson in 1913. As the name suggests, the concept aimed to investigate observable behaviour and learning outcomes. Moreover, the term refers to behavioural psychology, emphasising the theory of learning. Edward Thorndike and B. F. Skinner were the most influential education psychologists who focused on the behaviourist theories of learning. Skinner explained that learning is based simply on the mental connection between '*stimuli and responses*' (Donohue and Noll, 1995). 'Interaction' with the environment has been identified as a key term in behaviourism, which is known as the conditioning approach. Therefore, interactive and rich learning environments are required in order to facilitate learning, particularly for children with special needs. This assumption refers to the link between the learner and learning environment; therefore, Skinner suggested that focus on causal relations and the results of an action might be the greatest approach to recognising behaviour.

4.1.1.2 Cognitivism

Cognitivism theory replaced behaviourism theory in the 1960s as a learning paradigm that identifies understanding the mind's function. Jean Piaget (1954) investigated children's cognitive development, making critical perceptions of how children learn. Piaget identified four key steps of motor development (cited in Ojose, 2008): Sensorimotor; Preoperational; Concrete Operations; and Inference. Guey *et al*., (2010, p.107) described cognitivism as; "*Cognitive processes involved in learning, inclusive of induction, deduction, rule finding, law discovering, and pattern recognition*". Therefore, cognitivism learning paradigm was directed at

establishing cognitive approaches to developing the learning process. Cognitive approaches can be either mental practices or learning tools that provide support to help learners develop knowledge via memories or previous experiences.

Matlin (2002) stated cognition as the practice of "*acquisition, storage, transformation and use of knowledge*" (p.2). In a psychological context, cognitivism describes information and knowing how humans think. Piagets' work, cited in Dodonov and Dodonov (2011, p.1345), states; "*Cognitive development occurs through a process of equilibration, as humans assimilate new information about the world into existing cognitive structures or accommodate their cognitive structures to take the new information into account*". Cognitivism and behaviourism have many ideas in common; however, differences have also been identified. Behaviourism focuses on human behaviour, while cognitivism emphasises mental function.

Anderson's (1985) perspective of cognitive learning theory concentrates on information processing, which is a major perception in the field of cognitive psychology (1985); thereby, stressing the storing, modification, interpretation and recalling of information (Lachman *et al*., 1972). Consequently, Cognitive Load Theory (CLT) has been integrated into cognitivism, as developed by John Sweller (1994; 2012). Sawicka (2008, p.1041) notes that CLT: "*Builds upon an information processing view of cognition, defining long-term and working memory as the main structures of the human cognitive architecture*".

Baddeley's (1986) model explained the limited capacity of working memory in terms of storing information, although working memory plays a significant role in cognitive activities (1986). Hence, Sweller's (2011) CLT and that of multimedia learning (Sung and Mayer, 2012) have investigated the importance of limited capacity for information processing and the cognitive system in the context of learning and education. Paivio's (1986) dual-coding theory postulated two channels of information processing (visual and verbal) in working memory as a subsystem of the cognitive system (Kalyuga, 2012). It is important to note that these models become relevant when considering SEN due to limited cognitive faculties. Cognitivism and constructivism, which will be discussed in the following section,

are parallel concepts of 'knowledge construction'. Interestingly, minimal study has been conducted on the cognitive system of children with ADHD.

4.1.1.3 Constructivism

Constructivism is often defined as an extension or subdivision of cognitivism with a more precise consideration. Constructivism related originally to the nature of knowledge, as well as the relationship between the brain and information. Eggen and Kauchak (2003) define constructivism as a learning approach whereby learners create meanings from their own understanding, rather than an instructionism approach, which is viewed as teacher-driven. Young and Collin (2004) claim that over the last 25 years, constructivism has developed exponentially in a psychological context (i.e. cognitivism approach). The significant idea derived from constructivism learning paradigm is that '***learning is an active process***', whereby individuals construct his/her own perception of the world based on prior knowledge, experience and pre-existing outlines (Bruner, 1968).

Numerous studies define constructivism as an educational 'learning theory' with the emphasis on creating, constructing, inventing and developing knowledge (Agda *et al.*, 2011; Buyukduman and Sirin, 2010; Kang *et al.*, 2010; Payne *et al.*, 2009; Tenenbaum *et al.*, 2001; Reynolds, 2000; Keiny, 1994). Furthermore, John Dewey is one of the main philosophers contributing to the constructivism learning paradigm. He highlighted that knowledge construction can occur based on prior experiences, but this cannot be achieved without the active participation of learners.

Other research examines constructivism as 'pure discovery' learning (Piaget, 1954; Vygotsky, 1978). Furthermore, Piaget's work focuses on the intellectual development of children's minds, which can be divided into 'assimilation' (absorbing materials from the environment) and 'accommodation' (adapting their mental structures to cope with environmental demands). Constructivism theory considers the learning process to be one in which knowledge is developed from personal experience, while new concepts are processed in tandem with pre-existing ideas (e.g. Nie and Lau, 2010). This approach means that learners should use their rich background of knowledge to develop new concepts. However, the understanding of some learners is restricted; thereby illustrating they may not have

the required knowledge. Cobb *et al*., (1992) also pointed out that learning is viewed as an active and constructive process, in which learners are challenged to resolve problems in the classroom. Therefore, this perspective regards learning and teaching as an interactive process that requires negotiation of meanings. Seymour Papert (1975) claimed that learning is not a passive process; rather, it is an active and dynamic process through which learners construct their own knowledge. As a result, the constructivist learning environment requires a learner-driven approach (Young and Collin, 2004; Huang *et al*., 2010). Hence, a constructivist educator should provide a challenging, flexible and active classroom environment in order to directly motivate learners to be creative and critical thinkers.

In educational settings, Vygotsky's effort has established the perception of social constructivism (1978). Recently, numerous researchers have investigated the value of social constructivist theory as a foundation from which to apply effective learning environments (e.g. Rovai, 2004; Moreno *et al*., 2007; and Girvan and Savage, 2010). Tynjälä (1999) assumes that social constructivism stresses meaningful social interaction and collaborative manners. In this stance, Vygotsky has focused on the significance of social circumstance in the nature of education (i.e. cognitive development). He discussed that although assimilation and accommodation of new knowledge are crucial by learners; rich conversation and communication with others likewise play a significant role in social constructivist theory (Woo and Reeves, 2007). The social constructivist approach states that knowledge improvement lies mainly on the participation and interconnection in social society of learning communities through processing discussion and negotiations. Therefore, thinking, processing, and learning are placed in a social context.

Overall, this section has outlined three significant model of learning for how the mind processes information. The ability of processing information may vary between children with and without learning disabilities. Huge studies used different learning theories as an educational pedagogy (e.g. Garcia and Pacheco, 2013). As a result, in this study three stated learning theories utilize as a part of the pedagogy model. It should be noted that learning theory refers to the assumptions that the designer has of how the learner is expected to respond to a new stimulus. For example, when adopting a cognitivism approach, the learner is expected to attempt to comprehend a

new concept *as presented to them* and find a natural 'slot' in long term memory in to which the concept can be placed. In contrast, a constructivism approach would anticipate that the learners would reflect on the new concept and *develop their own comprehension* before integration into their personally constructed long-term memory. From the instructor's perspective the learner would require different interventions from them to support the learning process as governed by the determining learning theory. So as the learning theory has been selected in this thesis is mainly based on cognitivism, constructivism, and social constructivism approach, it would require the instructor to facilitate reflection and self-enquiry on the part of the learner, more so than of cognitivism were to be adopted. The question is 'to what extend the proposed mode of learning theory are applicable for ADHD children?'

4.1.2 Criterion 2: Mode of Engagement

An engagement mode can be defined as the activities arranged for both the instructor (facilitator) and the learner in order to engage in the learning process. The instructor adopts a particular role (such as *lecturer* or *guide*) and the learner must adopt a compatible role in return (*passive listener or active participant, respectively*). Different methods that can be employed include presentations, workshops, seminars, active projects, self-inquiry, performance, practice, demonstrations, and discussion. Because different modes of engagement are compatible with models of learning, they must be chosen with understanding of the model of learning that has been chosen. Self-inquiry, seminars and workshops are suited to the learning theories, especially constructivism, because in these the learner is required to be somewhat active in questioning and discussing to develop a personal understanding of a concept, whereas, performance and practice (of a skill) are more in accordance with behaviorism, since the emphasis is on practical skill development. Lectures and presentations are conventionally suited to cognitivism, due to the 'lesser' requirement for learner input in the learning process.

Paula Rutherford (2008) in her book presented the *instruction for all students* as a way of comparing two models of instruction: ***Instruction then*** and ***Instruction now,*** as explained in table 4-1 below.

Table 4-1: Instruction Then and Instruction Now

Instruction Then	Instruction Now
Teacher-centered	Learner-centered
Organized around time	Organized for results
Single teaching strategy	Multiple teaching strategies
Teaching once	Re-teaching and enrichment
Whole group instruction	Differentiated instruction
Passive learning	Active learning

Source: Adapted from Rutherford (2008)

Table 4-1 demonstrates two different Instruction models. Instruction now clearly shows the emphasis on the learner's requirements. Investigation of the more effective, Instruction Now, requires a significant factor called '*active engagement*'. Hence, the interaction between instructors and learners may develop learning since learners stay actively engaged on the lesson sustain their effort, and there is no requirement for memorisation. Consequently, the learner's brain can connect to the environment more easily. Junod and his colleagues (2006) claim that:

"*Research suggests that academic engagement refers to a composite of specific classroom behaviors, such as writing, participating in tasks, reading aloud, reading silently, talking about academics, and asking and answering questions*" (p.89).

Evidence shows that when children are engaged through the learning process, opportunities to react to given tasks will increase, which consequently develops levels of academic achievements. What is more important is 'whether ADHD children can actively engage with the lesson since it is expected that such children with a set of learning difficulties would display lower levels of active engagement?' (Referring to off- task behaviour) or, on the other hand, 'according to which instruction presented above would the learning performance of ADHD children increase?' In this respect, providing an appropriate academic environment is required in order to attract the attention of students with a particular learning difficulty. Overall, the different mode of engagement depends on types of 'Medium of Delivery', which are explained in the following section.

4.1.3 Criterion 3: Medium of Delivery

This criterion has highlighted the communication tool and interaction between teacher and the student. Formats for the conveyance of learning materials could be either technology-based or conventional manual based (classroom-based). Technology includes learning environments such as Web-based Mode, Social Media Mode, Multimedia learning Mode, Traditional computer-based Mode, Intelligent Tutoring Mode, Computer Supported Collaborative Learning Mode, and simpler ICT Mode, such as email, texting and discussion boards. The merits of each of these delivery modes for different learning theories and facilitation methods must be considered carefully. For instance, it would be difficult to arrange for a demonstration of a visual skill (such as drawing a graph plot of data) using a text only delivery channel, such as twitter. However, it would be possible to lecture via twitter, though not very convenient. Where reflection on new idea is needed, a social discussion forum with peers could be more suitable than a one-to one tutorial session with an instructor.

Colby (1973) was one of the first researchers to study educational programmes for children with special needs; specifically, Autism Spectrum Disorder (ASD). He examined the use of multimedia technology to improve language achievement of ASD children. The term 'multimedia' refers to computerised information (multiple representations of the similar information) that can be represented by a range of applications through visual vs. auditory channels (Schuler *et al*., 2012); thereby, presenting significant learning tools with which to improve individual learning (Seo and Woo, 2010). A recent study by Ramdoss *et al*., (2011) explored the use of computer technology as an intervention for developing the literacy skills (i.e. reading, vocabulary and writing) of children with ASD. Computer technology has been identified as a sustainable approach to teaching literacy skills to students with ASD. Alty *et al*., (2006) suggested that printed text seemed is a more appropriate method of cascading information; however, the use of graphics (i.e. animation, images, videos) appeared more appropriate to transfer details. As a result, research has exposed that ASD students often respond well to information that is visually represented. Furthermore, the effects of video-based intervention have been highlighted as a positive method of teaching autistic children (Rayner *et al*., 2009). Consequently, the majority of empirical research relied on visual stimuli to deliver

information to students with ASD (Reed *et al*., 2011). Moreover, this has targeted a variety of outcomes in terms of literacy skills, language and social interaction (verbal and non-verbal communication) (Wainer and Ingersoll, 2011). However, more research is required for experimental control.

One of the main assumptions derived from the literature investigation was the effectiveness of multimedia learning for children diagnosed with different disorders. Nicolson *et al*., (1991) recommended focusing methods on developing the spelling skills of dyslexic children. They stressed that this could offer the opportunity for such children to develop their weaknesses through multimedia applications. Nicolson and his colleagues maintained that the Self-Spell programme would improve the autonomy of children as well as demonstrating considerable passion in the use of the programme. In a similar investigation, Magnan and Ecalle (2006) examined the effect of audio-visual training on dyslexic children. Their findings contributed to the understanding of reading deficits, in addition to successful teaching. However, two issues have to be considered: first, children who are not IT literate cannot develop and generate knowledge through this medium; and second, integration between different information delivery types would be problematic for such learners in finding the relationships between representations.

Importantly, the main focus of this research is the educational problems encountered by children with ADHD, and there are many studies highlighting the academic failure and poor educational skills of ADHD children/adults. These will be discussed in detail in the following section. Moreover, several studies have focused on educational interventions; for instance, Tan and Cheung (2008) investigated the effects of computer-based learning on improving the collaboration and group activities of ADHD students (Watkins and Wentzel, 2008). They made recommendations focusing on different modes in which to develop the social skills of ADHD students. The study reported that computerised collaborative work has resulted in substantial achievements in the self-esteem of those with ADHD, in addition to fostering successful peer group participation and increasing the level of peer acceptance. Further, Bioulac and his colleagues (2012) explored the use of virtual classroom and virtual reality tools in order to evaluate ADHD students. They

developed the software as an integrated digital media to assess the attention processes of a child with ADHD. The study concluded that (p.519):

"*ADHD children performed significantly worse on the task than control subjects, as indicated by the lower number of correct hits and higher number of commissions. We then demonstrated a significant worsening of correct responses and reaction time over successive blocks which had previously never been analyzed*".

However, the virtual learning environment proposes some benefits for ADHD children, compared with classical tools, in addition to providing multimodal stimuli (*i.e.* visual and auditory mode). Klingberg *et al*., (2005) introduced a computerised programme as a treatment; its focus was on the memory of children with ADHD. The programme is provided in CD format, consisting of visuspatial working memory activities; therefore, students could use it effortlessly on their computers. Interestingly, the study contributed that using the computer programme to train ADHD children can improve their visual/verbal working memory.

Fabio and Antonietti (2012) have made efforts to incorporate hypermedia technology into the instructional programme for students with ADHD in order to develop learning performance in an actual and proficient manner. Their findings indicated the assimilation and construction of knowledge based in order to comprehend information and yield better results for ADHD learning outcomes. As discussed previously, the use of multimedia might be effective in the learning outcomes of special needs. Hence, when information is presented in different hypermedia formats, there is a possibility that ADHD students can benefit; since, in such a case, the learner could decide to choose a different representation of the same learning materials. The question to be asked is 'which types of information delivery 'Medium of Delivery' (i.e. multimedia-based, web-based, classroom-based, etc.) prove beneficial for children with ADHD in order to increase their active academic engagement or higher academic performance?' on the other word, 'why are hypermedia tools constructive and productive for children with ADHD?' (Fabio and Antonietti, 2012).

4.1.4 Criterion 4: Method of Facilitation

A learning intervention requires a means to facilitate the learning, which here refers to the ***source of knowledge*** and the ***regulatory authority*** in the process. An instructor can serve in both roles in a conventional lecture arrangement, but alternatively, the roles can be shared between the learner and instructor, *e.g*. in a 'practice' situation in which the learner must regulate their performance to match the requirements set down by the instructor (*Instructor-led*). It is possible for peers to serve as knowledge sources and regulators (in a true social learning environment) (*peer-to-peer discussion*), or for the learner to adopt both roles when they are truly engaging in an auto-didactic experience (*self-determined*).

Of course, there are interactions with the other elements of pedagogy that will determine that allowable choices. Available structures and design choices in pedagogy can provide an ideal learning environment for learners. For example, providing the learner with a combined method of facilitation, including instructor-led and peer-to-peer discussion, or shifting the structures in alternative options dependent on the individual characteristics of a learner should change from one pupil to another. This means that one way to address a learner's needs may be to change the facilitation method of the classroom several times so the learner can feel comfortable and engage with the learning material in optimal way.

What is more important is 'whether ADHD children can actively engage with a broad range of facilitation methods in the classroom'. For instance, learner-centered practices require encouragement of a child to participate in a specific task. Hence, three methods of facilitation could have a positive effect when appropriate or more interesting types of medium of delivery are used by instructor during the teaching episode. Moreover, this predicted less academic underachievement as well as a positive attitude of a child towards a lesson. With this in mind, the researcher's approach is to provide a comprehensive understanding of whether ADHD learners can perform well in peer-to-peer discussion while social impairment is present among them, or, in other words, how is a method of facilitation sought to support children's learning needs?

4.1.5 Criterion 5: Manner of Feedback (Student evaluation)

Feedback is one of the most effective educational pedagogy dimensions that can be found in a various methods (Hattie and Timperely, 2007). Providing feedback is the most powerful elements in order to motivate learners. In fact, feedback facilitates learning for learners with lower prior knowledge. Although cooperative learning environment does not promote learning outcomes, it may enhance the effectiveness of learner's active engagement, higher order thinking, and promote knowledge acquisition. In addition, empirical findings on the study of (Krause *et al*., 2009) show that "*feedback helps learners to reflect on the presented information and on their own knowledge and should thereby facilitate elaboration of the material, correction of misconceptions, and filling of knowledge gaps*" (p.160).

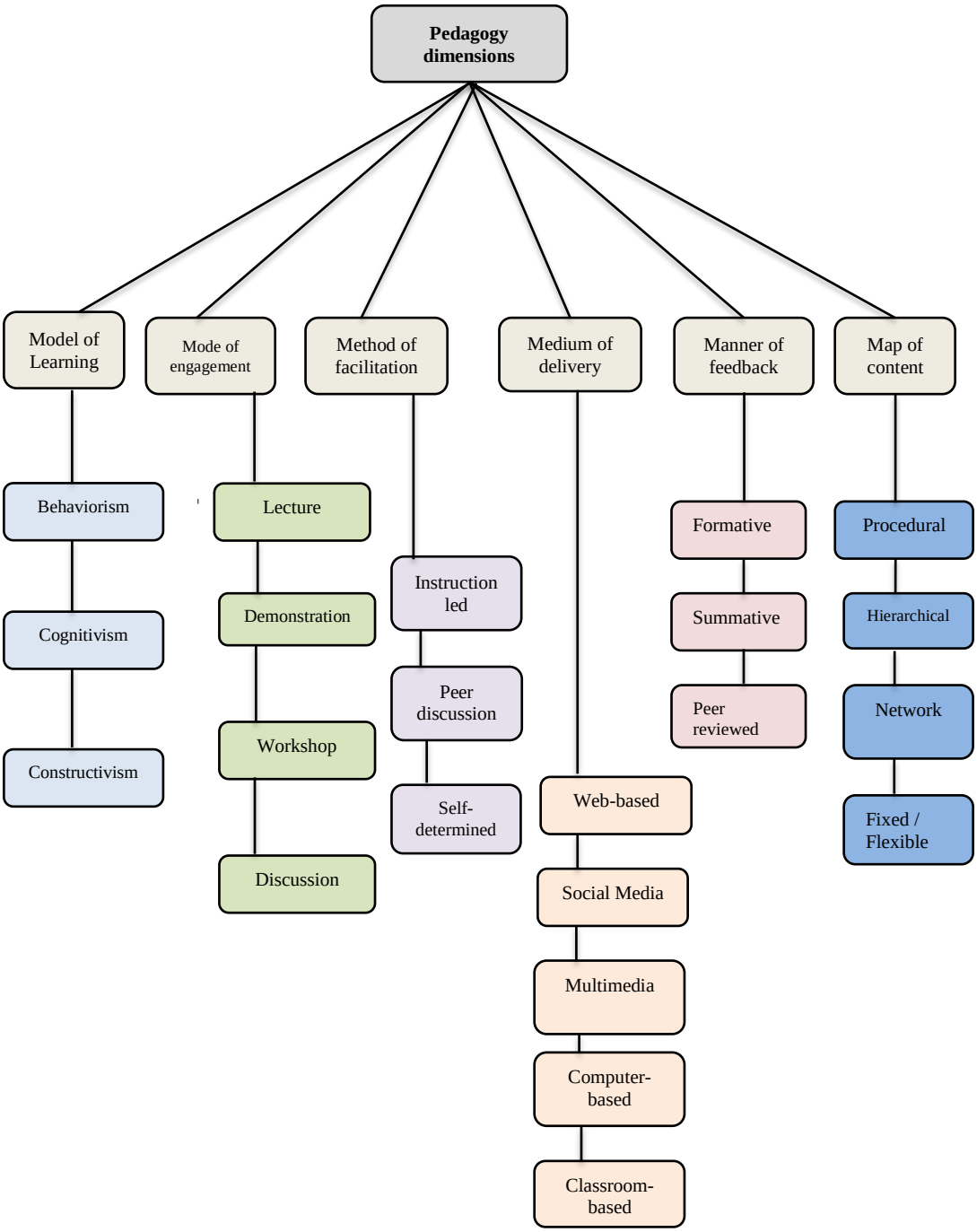
Different kinds of feedback include formative, summative, or peer. One of the common feedback methods is a grade that cannot be the best for those who are special needs, because despite their amount of efforts, they cannot approach to the high grades. Hence, these learners are not motivated to try harder when their scores do not reflect their attempt. Therefore, direct instruction step by step is required to evaluate their learning progress. This requirement helps learners to identify their strengths and weakness as well as their performance. This is called '*formative feedback style*' which allows learners to see more direct parallel relationships between efforts, actions, and outcomes. Gradually, this type of feedback allows learners to find out errors on their own and do self-correction, which may improve their self-regulation as well. In contrast, '*summative feedback style*' should be offered to learners at the end of the task. The style of the feedback is tied to the model of learning theory, so for example, a peer-to-peer formative feedback approach is suited to social learning based on constructivism, whereas, instructor lead summative feedback is a conventional style employed for cognitivism and behaviorism. Also, though, method of facilitation and medium of delivery will play a part in selecting the most appropriate feedback style. Peer-to-peer formative feedback may not be feasible in a classroom environment where the teacher is giving a presentation on a topic. Instead a discussion forum would be better. It is important to note that whether formative feedback may be best delivered in a one-to-one face-to-face tutorial situation for ADHD children?'

4.1.6 Criterion 6: Map of Content

Final element of pedagogy considered for the ***6Ms*** model is the structure of the learning material. It is possible to 'teach' an executable skill or an intellectual procedure in several ways: (1) by arranging the concepts in the order in which they are addressed when performing the skill or procedure; or alternatively (2) by organizing the concepts in a suitable learning hierarchy that facilitates scaffolding from simple-to-difficult, concrete-to abstract, or specific-to general.

The former structure facilitates automation of the skill or procedure by introducing in its ultimate sequence, although this may not be the most conducive arrangement for learning the individual steps. The latter structure complicates the automation of the process since concepts are introduced often out of sequence with respect to execution, but this arrangement may enable easier acquisition of individual steps due to consideration of 'ease of learning' as the primary reason for sequencing instruction. It is possible to differentiate also on the grounds of user control over navigation of the content: in one instance the map of content may be designed by a third party (such as the instructor or peers) with the navigation fixed; whereas in another instance, the map may be malleable as needed by the learner, such that navigation may be determined at the whim of the learner (*i.e*. a network structure). Model of learning (and other pedagogy factors) will impose an influence here, so for example, a network arrangement in which navigation is self-determined by the learner can suit constructivism, but a rigid learning hierarchy arrangement may be better for cognitivism based learning interventions. Alternatively, a rigid execution oriented arrangement may be best in behaviorism. Consequently, the researcher sought to determine if children with ADHD or different learning difficulties could benefit from any types of 'map of content' explained above. Figure 4-1 illustrates ***6Ms*** pedagogy Model explained above.

Figure 4-1: 6Ms Pedagogy Criteria



Source: Developed for the purpose of this research

To conclude, developing the ***6Ms*** pedagogy model requires appropriate attention be given to the pedagogy phenomenon that are associated with definitions and dimensions. This requires theoretical background followed by empirical efforts in dimensions. It is necessary to focus on conclusions that derived from the literature in which is critically dominant in the field. The primary conclusion is ***6Ms*** pedagogy Model in the literature that has revealed a research gap. It is clearly appears that there is still area for investigation; particularly in introducing a pedagogy schema that applicable for children with special educational needs ADHD children. Consequently, this subchapter has formulated a set of pedagogy criteria to the purpose of appropriate pedagogical learning environment.

4.2 Section 2: Validate Pedagogy Model (*6Ms*)

The main purpose of this section is to verify '***6Ms*** pedagogy model' in which derived from section 1 explained above. With this respect, the observation method in this stage of research provided opportunities for the researcher to determine whether different pedagogy criteria were used to teach ADHD children, and, to identify the best educational pedagogies being used at the special school for different types of AD/HD disorder. Therefore, this section will discuss evidence from both literature investigation followed by all four observations of one special school in London that support the fact that teachers make decisions about using different pedagogy criterion. Hence, research will then matches practice with every individual ***6Ms*** criterions. Consequently, the researcher will explain her evaluation of ***6Ms*** Pedagogy Model based on teachers' observation followed by teachers' interview.

In the first stage of the 6Ms pedagogy evaluation, Table 4-2 presented below illustrates the link between learning criteria including active learning, strong memory, knowledge integration, knowledge reflection, critical thinking, motivation, and socialsation;(e.g. Baddeley and Hitch, 1974; Paivio, 1991; Baddeley, 1999; Tynjälä, 1999; Rayan and Deci, 2000; Mayer, 2002; Young and Collin, 2004; Rovai, 2004; Liaw, 2005; Sesen and Tarhan, 2010; Huang *et al.*, 2010; Bolliger *et al.*, 2010); and on the other hand pedagogy criteria including model of learning, model of engagement, method of facilitation, medium of delivery, manner of feedback, and map of content which emerged from the literature investigation. According to citations above, areas shown by 'Y' explain the specific pedagogy option required

particular learning criterion by the learner; however, areas shown by 'N/R' explain no link exposed between the specific options of pedagogy and learning criterion. Moreover, areas covered by 'N' means the possibility of the specific learning requirement for the pedagogy option.

Table 4-2: Tentative Model of the Link between Learning Criteria and Pedagogy Criteria

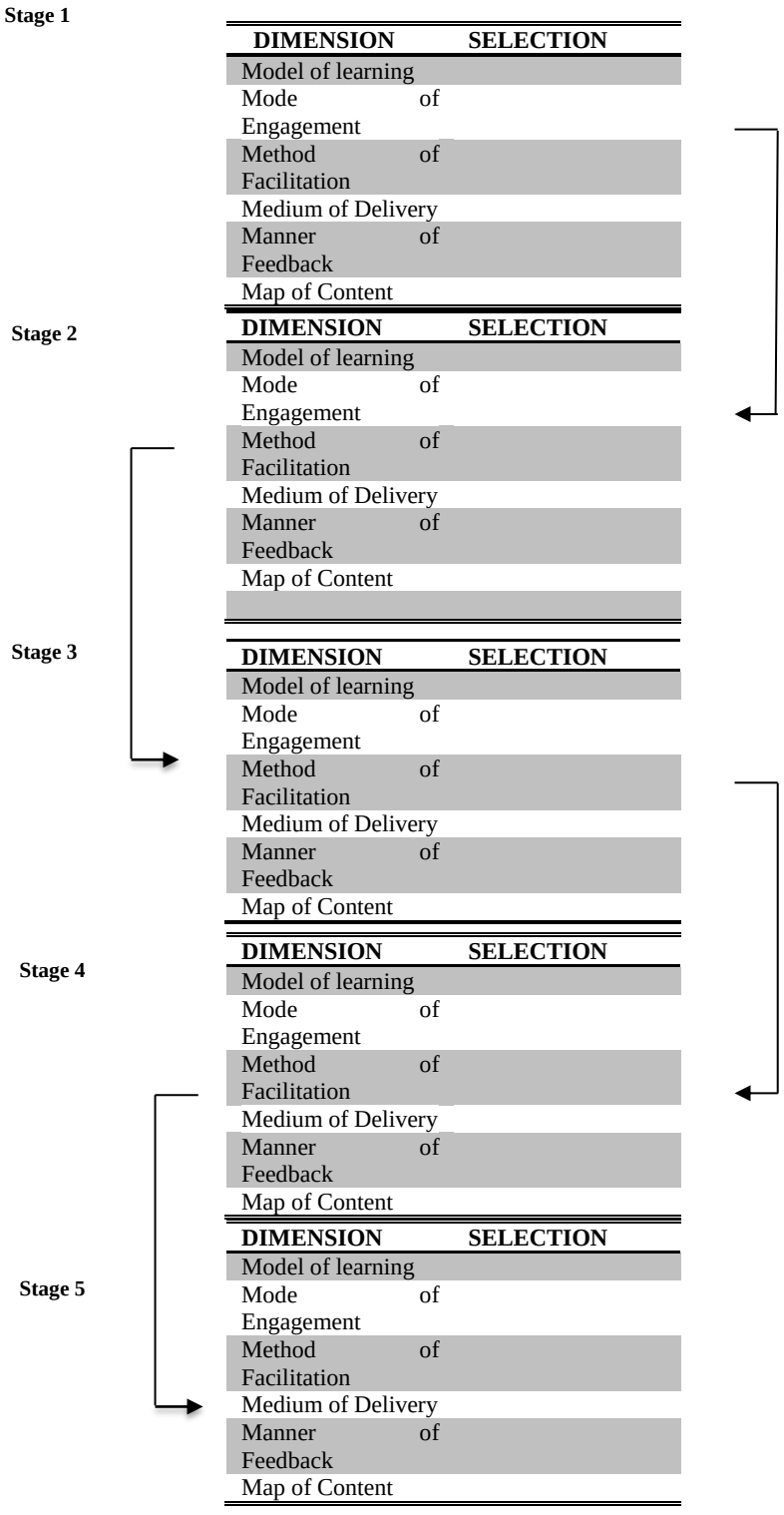
Pedagogy options	**Learning Criteria**						
	Active Learning	**Strong Memory**	**Knowledge Integration**	**Knowledge Reflection**	**Critical Thinking**	**Motivation**	**Socialisation**
Model of learning							
-Constructivism	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
-Behaviourism	**Y**	**N/R**	**N**	**N**	**N**	**Y**	**Y**
Mode of engagement							
-Lecture	**N/R**	**N/R**	**N/R**	**N/R**	**N/R**	**N/R**	**N/R**
-Discussion	**Y**	**N**	**N**	**N**	**Y**	**Y**	**Y**
Method of facilitation							
-Instruction lead	**N/R**	**N/R**	**N/R**	**N/R**	**N**	**N/R**	**N/R**
-Self-determined	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N/R**
Medium of delivery							
- Social media	**Y**	**N/R**	**N/R**	**N/R**	**N**	**Y**	**Y**
- Multimedia	**Y**	**N**	**Y**	**N**	**N**	**Y**	**N/R**
Manner of feedback							
- Formative	**N/R**	**N/R**	**N/R**	**N/R**	**N/R**	**N/R**	**N/R**
-Peer reviewed	**Y**	**Y**	**N/R**	**N/R**	**N/R**	**N/R**	**Y**
Map of content							
-Procedural	**Y**	**N/R**	**N**	**N**	**Y**	**Y**	**N**
-Fixed/flexible	**Y**	**Y**	**N**	**N**	**Y**	**Y**	**N**

- **Y:** Yes
- **N:** Neutral
- **N/R:** Not Required

Source: Developed for the purpose of this research

The second stage of pedagogy model (6Ms) evaluation require presenting Figure 4-2 'lesson structure' followed by Table 4-3 'sample of timeline table', which will be then completed after classroom observation by teacher's interview.

Figure 4-2: Lesson Structure



Source: Derived from teachers' interview

In order the Figure above to be completed, the researcher has provided a timeline table to be fill in during the class. The timeline table should consists of tasks / activities and a brief reports on the key events arisen during the lesson. With this respect, according to four classroom observation, four timeline tables have been completed. Completed timeline tables have been shown to the relevant teacher in order to re-check the activities filled in by the researcher. Hereafter, the ***6Ms*** pedagogy criteria including: Model of learning, Mode of engagement, Method of facilitation, Medium of delivery, Manner of feedback, and Map of content has been checked and matched with each task or activity in which done during the lesson. The sample of timeline table provided as below:

Table 4-3: Sample of Timeline Table

	Activity	Timeline (Minutes)	Description
Stage1	**1**	1min-3min	
	2	4min-6min	
	3	7min-8min	
Stage2	**4**	9min-12min	
	5	13min-14min	
	6	15min-19min	
Stage3	**7**	20min-24min	
	8	25min-31min	
	9	32min-35min	
Stage4	**10**	36min-41min	
	11	42min-48min	
	12	49min-53min	
	13	54min-55min	
Stage5	**14**	56min-57min	
	15	58min-68min	
	16	69min-72min	
	17	73min	

Source: Developed for the purpose of the study

4.2.1 Model of learning

Over the past decades, the significance of the classroom-learning environment has been progressively recognized within special education teachers. Studies of (Ozkal *et al*., 2009) stated, "*Learning environment refers to the social, psychological, and pedagogical context in which learning occurs and which affects students' achievement and attitudes*" (p.71). As explained earlier in section 1, *Model of learning* refers to different social, psychological, and pedagogical learning theories including: behaviorism, cognitivism, constructivism, and social constructivism. Evidence from all four observations illustrates that Model of learning has been applied during the lesson as an educational pedagogy support children with special needs.

According to activity (5) in the first classroom observation '*Teacher reminded previous lesson by going through each picture drawn on the board*', teacher has applied ***constructivist-learning environment*** as a theoretical position in education. This model of learning has an important impact on the learning approaches in which focus on AD/HD children's understating. Findings from teacher's interview illustrate the central principle of constructivism as a model of learning, which is in line with the literature (*e.g.* Agda *et al.*, 2011). One of the teacher believed that "*Children construct their own knowledge through pre-existing knowledge / prior experiences*" (Teacher 2). This has forced ADHD children to recall information from their long-term memory in order to develop new knowledge based on previous information.

Similarly in activity (3) from the second classroom observation '*Children think about mental math and why do they do mental math*', teacher changed the class from a teacher-centered to a learner-centered environment. So, children had to refer to their past knowledge on mental math and determine why mental math was important. In such learning environment, the teacher performed as a facilitator to provide indications from past experiences. Moreover, according to activity (2) from the third classroom observation '*Teacher showed them flash cards from previous lesson (number lines) and raised a question*' teacher makes children think on a task individually. Therefore, teacher provided support for children to help them think in a constructivist manner and construct their own knowledge through experience, observation, discussion with peers, and questioning. With this respect, children are

more independent on tasks and more empowered over learning, which may produce meaningful learning. Overall, Model of learning that proposed as one of the 'M' has been verified through teachers' observation followed by interview.

4.2.2 Mode of engagement

Students with special educational needs, particularly ADHD children associated with type of learning difficulties due to brain dysfunction, cognitive deficit, or other genetic reasons. This is why such children are not able to learn in a same way as typically developing learners. Inattentiveness, hyperactivity / impulsivity, distractibility, social / communicational difficulties or other symptoms between ADHD are not allow child to engage into the learning. With this respect, appropriate intervention approaches can be employed to help ADHD children with their academic difficulties. Furthermore, appropriate *mode of engagement* can help children and provide them support in order to overcome with their limitations.

According to observations, teachers have used strategies to maximize interaction between teacher and students. This would also reduce children's disruptive behavior. Teachers mainly believed on '***demonstration***' approach in which supplemented with visual / pictorial or graphical forms of learning materials. In this regards, one of the teachers noted, "*ADHD children are more able to comprehend meaning from what is being lectured about visual form of information*" (Teacher 4). Having such mode of engagement can reduce difficulties with information processing since; ADHD children are more tend to be visual than verbal which is in line with the literature (*e.g.* Fabio and Antonietti, 2012).

According to the activity (2) from the forth classroom observation '*Teacher distributed colorful flash cards from the prior lesson and asked them to discuss with their partner*' teachers have used demonstration as an engagement mode in order to provide visual examples or symbols to help children better remembering learning materials. Moreover, teachers believe that demonstration as a teaching process could have significant effect on students' active engagement to the learning environment. On the other hand, according to the activity (3) from the first observation '*Teacher gave instruction for reading task*' teachers applied 'lecture approach' as a mode of

engagement. Depending on individual differences, children may absorb amount of information, recall and process.

Findings from teacher's observation and interview suggested that mode of engagement as an effective educational pedagogy for learners, especially for children with ADHD. Different types of engagement mode have been observed, however, students were more engaged with learning activities when having information presented through demonstration.

4.2.3 Medium of delivery

As explained in the literature, children with special educational needs have difficulties to develop cognitive skills and attain new knowledge (Fernández-López, 2013). It is critically important to individualize learning activities based on children' abilities and skills. Teachers believe that poor motivation, as an important factor of learning among ADHD children does not allow students to engage into tasks or learning activities. This is so teachers suggested effective visual-oriented teaching techniques to focus particularly on children's motivation. Moreover, multimedia-based learning system provides opportunity for ADHD children having more than one separate *information delivery type*. Teachers also believe that this principle is significantly vital for learners who have impairments in auditory / verbal information processing.

To support the idea above, activity (7) from observation one '*Teacher turned on the computer, opens the software, draw pictures and typed the start letter of each word shown by picture*' represents that ADHD children have greater reliance on their visual processing channel than verbal. With this respect teacher noted, "*When presenting learning materials to ADHD children it is necessary to provide visual prompts to foster their successful learning*" (Teacher 2). With this respect, the use of technology (*i.e.* computer-based learning) has been identified as an effective instructional pedagogy of improving learning skills of students with AD/HD. Evidence from teachers' observation and interviews reveals that visual-oriented educational pedagogy consisting of pictures, video, graphs, or animation commonly being used to support learner attention and interest. Such medium of delivery offers a powerful learning environment for developing ADHD cognitive skills in order to promote meaningful learning. For instance, according to activity (2) from

observation three, '*Teacher showed them flash cards from previous lesson (number lines) and raised a question*' teacher was aimed to offer visual prompts in order to help children overcome with their poor working memory. To support above, activity (2) from observation four '*Teacher distributed colorful flash cards from the prior lesson and asked them to discuss with their partner*' likewise has focused on visual types of learning material. Therefore, presenting visual learning materials may support learner to remember more amount of information. As a result, different medium of delivery have been offered by teachers, which they mainly focus on cognitive skills of AD/HD children. Thus, to avoid cognitive deficits affecting children's learning, it is important to individualize tasks or learning activities based on different skills. To sum up, observation illustrates that AD/HD learners are tend to be more visual. As such, interactive pattern of visual-oriented educational pedagogy would be appropriate information delivery type, which is in line with the literature (*e.g.* Chen and Sun, 2012).

4.2.4 Method of facilitation

As frequently discussed in this research, ADHD is one of the developmental disorders, which causes significant deficiencies across different situations. Self-monitoring (self-regulation) has been identified as one of the main cognitive deficits among ADHD children. Studies of (Shiels *et al*., 2010) claim that "*Empirical evidence for impairments in neurophysiological and behavioral correlates of self-regulatory processes including self-monitoring (e.g., error-processing)*" (p.951). As such, evidence from observation illustrates that; deficient self-regulation may cause performance failure of ADHD children on learning and information processing. According to activity (13) from observation two '*Silence-doing a puzzle with helping teacher and teacher assistants' feedback*' teacher was aimed to focus on the ability of 'self-monitoring'. With this respect, teachers believe that self-determined activities require high attentional skills, memory skills, response inhibition, and patience in order to effectively engage to a self-study technique. Therefore, external stimuli may distract child from doing an activity. However, teacher assistants playing significant role in helping children focus on their activities. Moreover, motivational factors and interactive learning environment could provide some support as a facilitator to help children stay to their activity.

According to activity (3) from observation one '*Teacher gave instruction for reading task*' teacher was targeted to provide '*instruction lead*' as a facilitation method in order to make children listen carefully, pay particular attention, and follow the instruction. This activity took one minute since such children are not able to stay focus on one activity for a long time. On the other hand, 'peer-discussion' has been observed as one of the other ***method of facilitation***. For instance, activity (11) from observation one '*Children engaged to the group activity with teacher assistant guidance*' and activity (14) from observation two '*Sharing puzzle to the other children*' teacher was aimed to build the communicational / social skills of children. According to the literature, group activity has been known, as supportive educational strategy to help special needs deal with their social impairments (*e.g.* Tan and Cheung, 2008). However, teachers believe that "*Collaborative learning environment requires teachers and teacher assistants play a role of facilitator*" Teacher (2).

To conclude, different methods of facilitation have been emerged from teacher's observation and interview. The ideal educational pedagogy therefore requires recognizing correct diagnosis of children and views children with their core symptoms. This would support teachers providing an appropriate facilitator match with individual skills.

4.2.5 Manner of feedback

The academic and social lives of ADHD children can be considerably affected by their symptoms and different impairments they associated with. Teachers play significant role on assessing such special needs children. Results from literature reveal that "*Teachers have fewer problems when assessing children that are hearing-impaired, physically-impaired or visually-impaired. On the other hand they have major problems in assessing children with specific language impairment or children with ADD or ADHD*" (Hussu and Strle, 2010, p.5281).

From teacher's observation, three types of student evaluation have been identified including formative, summative, and peer-reviewed which is in line with the ***manner of feedback*** from ***6Ms*** pedagogy model. However, Teachers acknowledged that the peer-reviewed and formative assessment would be best approach for student evaluation. For instance, according to the activity (12) from observation one

'*Children shared their ideas*' and activity (12) from observation three '*Teacher asked them to share their answers with their partner*' teacher was aimed to help children in gaining more confidence, developing group activities, and learn how to share. Moreover, both teachers and teacher assistants' role was significantly vital in order to guide children with their learning outcomes. With this respect, activity (4) from observation two '*Children share their thoughts and ideas while teacher correct them*' illustrates formative feedback while students doing an activity. Teachers believe that such evaluation oftentimes with encouraging children could be effective assessment. In addition, one of the teachers noted, "*The central aim of students' assessment does not really mean the knowledge evaluation but to encourage and motivate ADHD children to develop their skills and manage their learning*" (Teacher 4).

To conclude, teachers should provide opportunities for children to be involved in assessment. Moreover, teachers must support children to take an active participation in discussion and evaluation. This may one of the best ways to assess children with learning difficulties. On the other hand formative feedback enables children to progress their learning during the activity.

4.2.6 Map of content

As explained earlier, *map of content* in ***6Ms*** pedagogy model refers to the structure of the learning material. In this section, the researcher examined the relations of learning materials and how teachers structure learning content in a way to present for special needs. Evidence from teachers' observation clarifies that learning concepts introduced often out of sequence. With this respect, teachers believe that navigation of content is more depends on the ability of children. One of the teachers noted, "*The steps to follow must be standard and suitable for children and their learning style*" (Teacher 3). According to activity (2) from observation two '*Teacher raised a question about the previous lesson and put children into peers*' teacher was planned to present instruction through constructivist-learning environment. Since this activity relates to the beginning of the lesson, it provided challenging learning environment for children with ADHD. As such, children involved in social trajectories, which demands a lot effort for children with social impairments to collaboratively involve into the activity. It can be seen from all four timeline tables that teachers aimed to

start the lesson with difficult activities and finish the lesson with simple and interesting task. For instance, activity (2) from observation four '*Teacher distributed colorful flash cards from the prior lesson and asked them to discuss with their partner*' represents complicated task, however, activity (12) '*Children share their puzzles to others*' represents the simpler task due to the children's interests. Overall, evidence from teacher's observation and interview shows that lesson structure called '***map of content***' mainly represents from difficult-to-easy since in general, children's brain are more fresh in the beginning of the lesson to absorb huge amount of learning materials.

4.2.7 Link between classroom activities and lesson structure

Thus far, the researcher has considered individual pedagogy criterion from (6Ms) pedagogy model in order to test the model in a real classroom environment for special children who may be assumed to have a particular set of cognitive deficits. As discussed prior section, the 6Ms pedagogy model is valid. So the researcher now provided timeline-tables in which used to support above explanations.

Table 4-4: Timeline Table (1st Classroom Observation)

	Activity	Timeline (Minutes)	Description
Stage1	**1**	1min-3min	Class starts: children took learning tools (*i.e.* pens, eraser, and small whiteboards) from their stationary desk
	2	4min-6min	Teacher draw pictures on board as teacher assistant made children ready for the lesson
Stage2	**3**	7min-8min	Teacher gave instruction for reading task
	4	9min-12min	Children engaged to the class activity with teachers' guidance
	5	13min-14min	Teacher reminded previous lesson by going through each picture drawn on the board
	6	15min-19min	Children engaged in learning activities within discussion using their tool-kit for a certain time while both teachers and teacher assistant correcting them
Stage3	**7**	20min-24min	Teacher turned on the computer, opens the software, draw pictures and typed the start letter of each word shown by picture
	8	25min-31min	Teacher asked students to say the words, repeat it, and pronouncing the start alphabet
	9	32min-35min	Divided children in two groups
Stage4	**10**	36min-41min	Handout papers to the children and explained instruction for the class
	11	42min-48min	Children engaged to the group activity with teacher assistant guidance
	12	49min-53min	Children shared their ideas
Stage5	**13**	54min-55min	Teacher told children to go back to their individual stationary desk
	14	56min-57min	Teacher provided them puzzle and set the time for 10minutes
	15	58min-68min	Silence-doing a puzzle with helping teacher and teacher assistants' feedback
	16	69min-72min	Shared puzzle to the other children
	17	73min	Finish the class

Source: Derived from observation analysis

Table 4-5: Timeline Table (2nd Classroom Observation)

	Activity	Timeline (Minutes)	Description
	1	1min-2min	Class starts: children take learning tools (*i.e.* pens, eraser, and small whiteboards) from their stationary desk
Stage1	**2**	3min-5min	Teacher raised a question about the previous lesson and put the children into peers
	3	6min-8min	Children think about mental math and why do they do mental math
Stage2	**4**	9min-10min	Children share their thoughts and ideas while teacher correct them
	5	11min-15min	Teacher presents them learning material and provide them a task through handouts
	6	16min-18min	Children engage into activity within peer-discussion with the observation of teacher and teacher assistant
	7	19min-25min	Teacher select volunteers to explains their results
Stage3	**8**	26min-29min	Teacher asks children to explain differences between ideas
	9	30min-33min	Dividing children in groups to think
	10	34min-38min	Sharing their ideas in the class
	11	39min-40min	Teacher tells children to go back to their individual stationary desk
Stage4	**12**	41min-43min	Teacher provide them puzzle and set the time for 10minutes
	13	44min-54min	Silence-doing a puzzle with helping teacher and teacher assistants' feedback
	14	55min -57min	Sharing puzzle to the other children
	15	58min	Finish the class

Source: Derived from the observation

Table 4-6: Timeline Table (3rd Classroom Observation)

	Activity	Timeline (Minutes)	Description
Stage1	**1**	1min-2min	Class starts: children sit and make circle, take learning tools (*i.e.* pens, eraser, and small whiteboards) from their stationary desk
	2	3min-5min	Teacher showed them flash cards from previous lesson (number lines) and raised a question
	3	6min-8min	Children sat with their peers and discusses about the flash cards shown by teacher while teacher and teacher assistant were listening to them
Stage2	**4**	9min-11min	Children volunteered to share the idea with the class
	5	12min-15min	Teacher stick flash cards on the board
	6	16min-18min	Children have asked to say the numbers whether big or small
	7	19min-23min	Teacher selected volunteers to explain
	8	24min-26min	Teacher raised a question through flash cards and made children think
Stage	**9**	27min-33min	Children volunteered for the answers and discussed
	10	34min-37min	Teacher provided them flash cards and asked them to practice with their partners
	11	38min-41min	Teacher wrote a question on the board and asked children to solve the problem individually after explanation
Stage4	**12**	42min-45min	Teacher asked them to share their answers with their partner
	13	46min-48min	Teacher selected one child to share the idea with class
	14	49min -50min	Teacher asked them to put their tool kit into their stationary
	15	50min	Finish the class

Source: Derived from the observation

Table 4-7: Timeline Table (4th Classroom Observation)

	Activity	Timeline (Minutes)	Description
Stage1	**1**	1min-3min	Class starts: teacher assistant helped children to get ready for the lesson
	2	4min-7min	Teacher distributed colorful flash cards from the prior lesson and asked them to discuss with their partner
Stage2	**3**	8min-10min	Teacher assistant supported children by going through the task step-by-step
	4	11min-12min	Teacher asked them to share their idea
	5	13min-17min	Teacher asked them to open their story book and start talking about while teacher and teacher assistant were both observing
Stage3	**6**	18min-19min	Teacher asked them to summarize the discussion
	7	20min-25min	Children have used their highlight pens to pull out the main ideas while teacher and teacher assistant were observing them
Stage4	**8**	26min-28min	Teacher selected a child to explain what they have remember
	9	29min-34min	Children had to stick the flash cards on the board
	10	35min-36min	Teacher provided a puzzle
	11	37min-47min	Children engaged to the task individually
	12	47min-49min	Children share their puzzles to others
	13	50 min	Finish the class

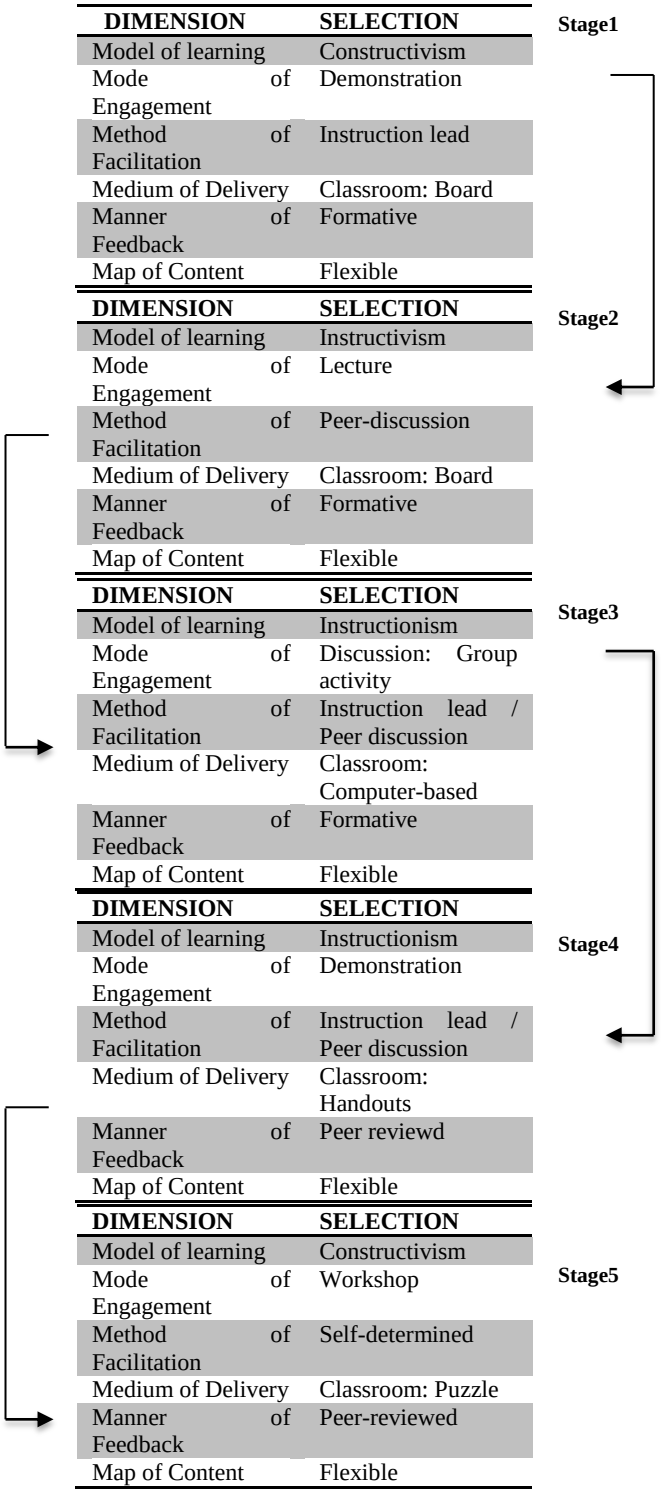
Source: Derived from the observation

Hereafter, researchers' purpose is to model above timeline tables and integrate them into pedagogy schema in which designed based on the real learning environment. With this respect, according to teachers' interview, pedagogy designed for a classroom environment in which the instructor made decisions about different pedagogy criterions. This is because the course designer or instructor is able to identify what localized changes are needed to the pedagogy to achieve the most conductive setting for particular learning objectives. This approach provides greater control and justification for the design of the learning sessions, and allows the course designer to plan a series of sessions to achieve a set of objectives, which move through the program successively by modifying the pedagogy in specified ways.

According to Figures below, different stages with different pedagogy dimensions decided and agreed by the instructor. What significant is that ***6Ms*** dimensions has changed in different stages. In fact, one of the important differences between stages related to the model of learning. Results from four teacher's interview and classroom observation illustrate that Models of learning were mainly based around two modes of *Constructivism* and *Instructionism* in which clarify different manners of learning modes take place in people. In addition, the other important difference between stages has been identified as method of facilitation, which places onus on different actors for the two roles of knowledge source and regulator. The content map is also different and imposes restrictions on the navigation available to the learners and regulators. On the other hand, the medium delivery on all stages was based on the classroom; however, different tools such as computer and computer program have been used. In general, the progression in pedagogy started with formative assessment and followed by peer review of the learners' performance in which learners presents their new knowledge in the classroom for the performance evaluation by peers.

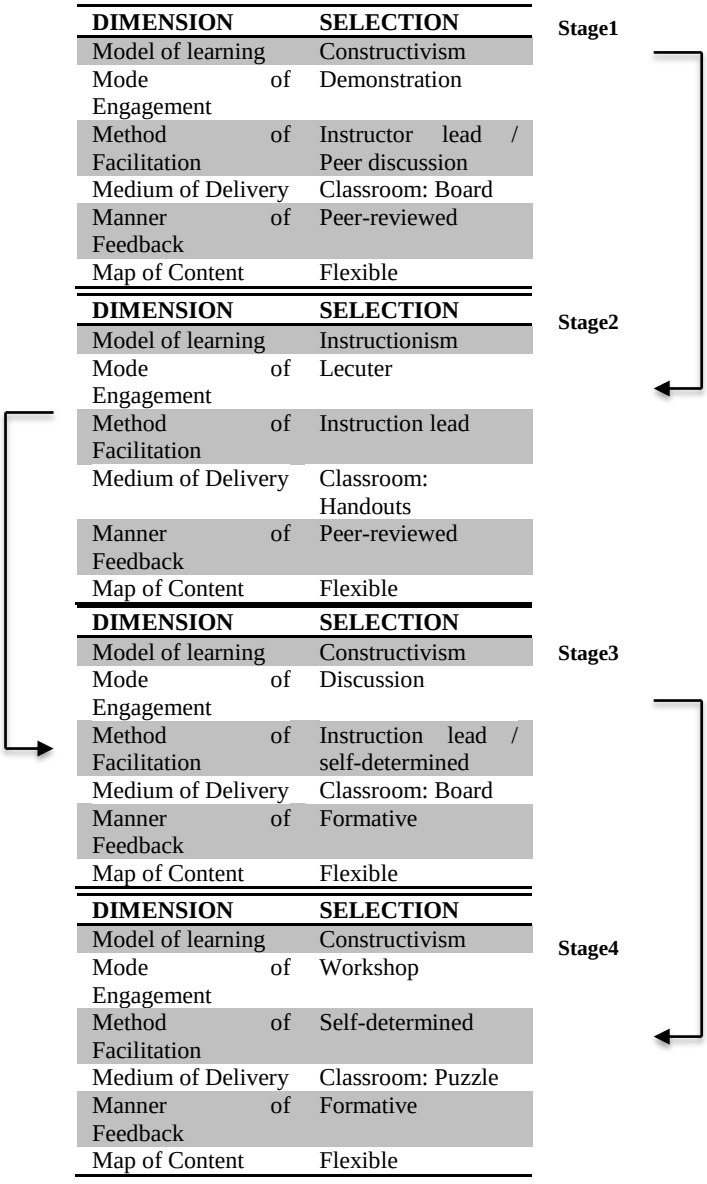
The real benefit that all four pedagogy schemas bring is that it permits an instructor to make controlled changes to the pedagogy in order to create a lesson plan that progress not only in terms of content, but also on the basis of the pedagogy. Overall, it can be clearly seen from Figures below that the instructor has applied different parameters to manipulate in seeking to provide the most efficacious learning interventions for learners with special needs.

Figure 4-3: Lesson structure (1st classroom)



Source: Derived from teachers' interview

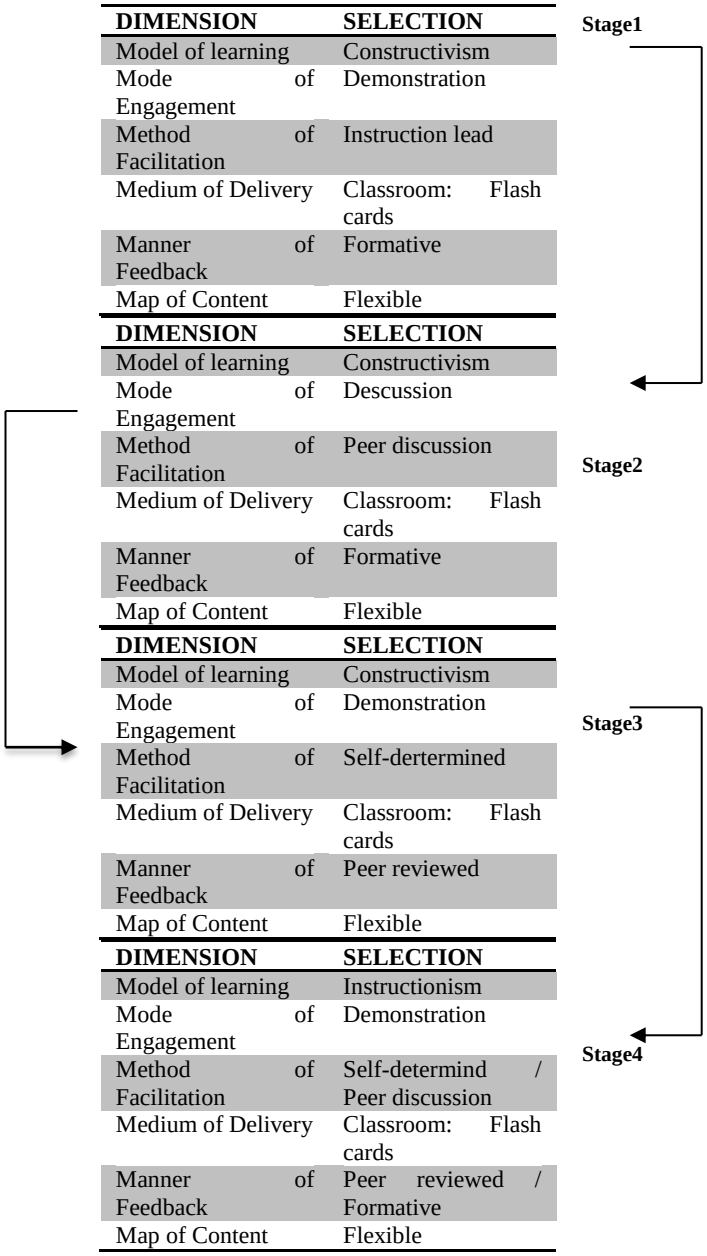
Figure 4-4: Lesson Structure (2nd classroom)



DIMENSION	SELECTION	
Model of learning	Constructivism	Stage1
Mode of Engagement	Demonstration	
Method of Facilitation	Instructor lead / Peer discussion	
Medium of Delivery	Classroom: Board	
Manner of Feedback	Peer-reviewed	
Map of Content	Flexible	
DIMENSION	**SELECTION**	
Model of learning	Instructionism	Stage2
Mode of Engagement	Lecuter	
Method of Facilitation	Instruction lead	
Medium of Delivery	Classroom: Handouts	
Manner of Feedback	Peer-reviewed	
Map of Content	Flexible	
DIMENSION	**SELECTION**	
Model of learning	Constructivism	Stage3
Mode of Engagement	Discussion	
Method of Facilitation	Instruction lead / self-determined	
Medium of Delivery	Classroom: Board	
Manner of Feedback	Formative	
Map of Content	Flexible	
DIMENSION	**SELECTION**	
Model of learning	Constructivism	Stage4
Mode of Engagement	Workshop	
Method of Facilitation	Self-determined	
Medium of Delivery	Classroom: Puzzle	
Manner of Feedback	Formative	
Map of Content	Flexible	

Source: Derived from teachers' interview

Figure 3-5: Lesson structure (3rd classroom)



DIMENSION	SELECTION
Model of learning	Constructivism
Mode of Engagement	Demonstration
Method of Facilitation	Instruction lead
Medium of Delivery	Classroom: Flash cards
Manner of Feedback	Formative
Map of Content	Flexible

Stage1

DIMENSION	SELECTION
Model of learning	Constructivism
Mode of Engagement	Descussion
Method of Facilitation	Peer discussion
Medium of Delivery	Classroom: Flash cards
Manner of Feedback	Formative
Map of Content	Flexible

Stage2

DIMENSION	SELECTION
Model of learning	Constructivism
Mode of Engagement	Demonstration
Method of Facilitation	Self-dertermined
Medium of Delivery	Classroom: Flash cards
Manner of Feedback	Peer reviewed
Map of Content	Flexible

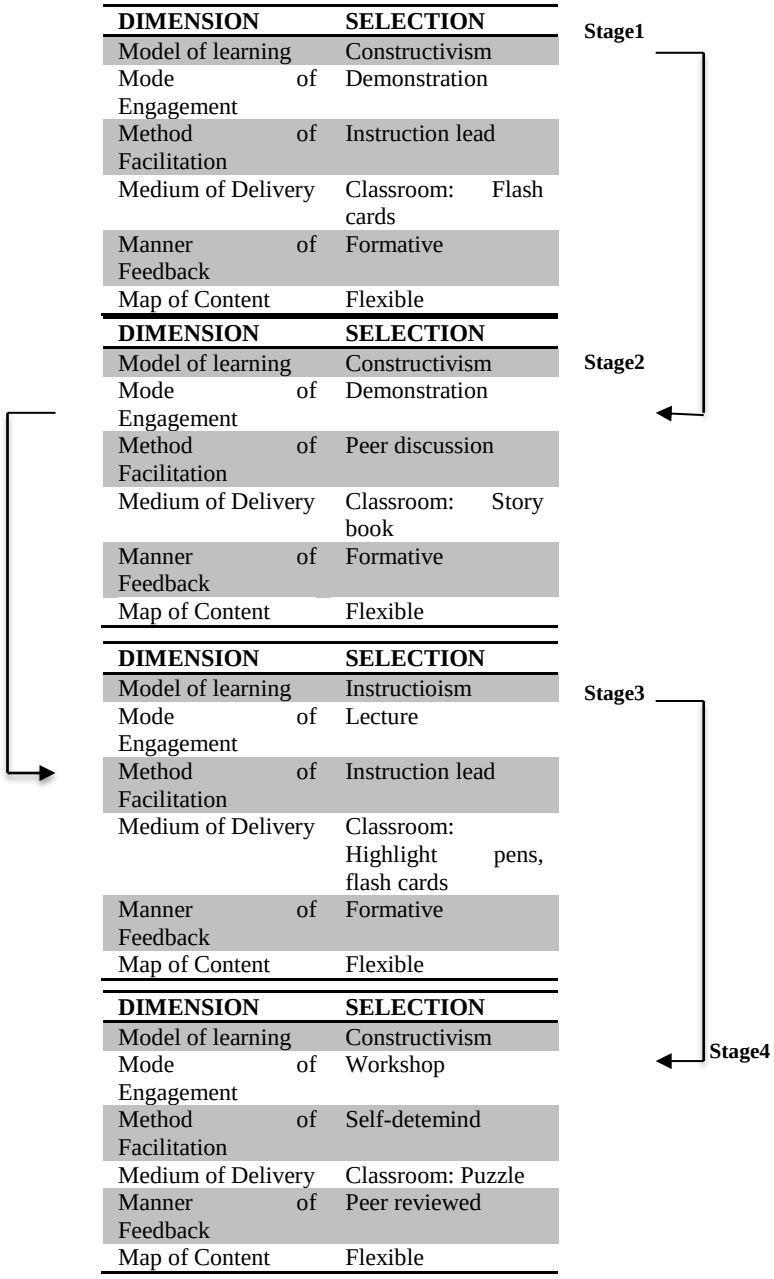
Stage3

DIMENSION	SELECTION
Model of learning	Instructionism
Mode of Engagement	Demonstration
Method of Facilitation	Self-determind / Peer discussion
Medium of Delivery	Classroom: Flash cards
Manner of Feedback	Peer reviewed / Formative
Map of Content	Flexible

Stage4

Source: Derived from teachers' interview

Figure 4-6: Lesson Structure (4th classroom)



DIMENSION	SELECTION
Model of learning	Constructivism
Mode of Engagement	Demonstration
Method of Facilitation	Instruction lead
Medium of Delivery	Classroom: Flash cards
Manner of Feedback	Formative
Map of Content	Flexible

Stage1

DIMENSION	SELECTION
Model of learning	Constructivism
Mode of Engagement	Demonstration
Method of Facilitation	Peer discussion
Medium of Delivery	Classroom: Story book
Manner of Feedback	Formative
Map of Content	Flexible

Stage2

DIMENSION	SELECTION
Model of learning	Instructioism
Mode of Engagement	Lecture
Method of Facilitation	Instruction lead
Medium of Delivery	Classroom: Highlight pens, flash cards
Manner of Feedback	Formative
Map of Content	Flexible

Stage3

DIMENSION	SELECTION
Model of learning	Constructivism
Mode of Engagement	Workshop
Method of Facilitation	Self-detemind
Medium of Delivery	Classroom: Puzzle
Manner of Feedback	Peer reviewed
Map of Content	Flexible

Stage4

Source: Derived from teachers' interview

Taken collectively, this section in particular deliberates the results of the analysis teachers' observations and interviews addressing the 6Ms pedagogy model. Moreover, this section aimed to integrate observations (timeline tables) with the pedagogy schemas (lesson structure). Evidence from all four observations and interviews has supported the fact that teachers make decisions about different types of educational pedagogies. In this subchapter, section 2 was aimed to validate the ***6Ms*** pedagogy model. With this respect, the researcher has evaluated each individual 'M' from 6Ms through teachers' observation. In fact, ***6Ms*** Pedagogy Model has been verified and has matched practices. However, researcher's evaluation illustrates that the 6Ms model derived from the literature is NOT complete. Hence, **7Ms** (*mind perspective*) need to be added to 6Ms model in order to cover the four roles of teachers (**expert:** Clinical / diagnostic; **coach:** Developmental / life & work management; **teacher:** Diagnostic / didactic / pedagogic; and **parent:** Wellbeing / emotional / daily life) which will be discussed in the following section. This has proved that ***7Ms*** needed in order to develop appropriate pedagogy schema for children with ADHD in which looked at different roles that teacher and teacher assistance might change during a lesson while delivering learning materials.

4.3 Section 3: 7Ms (Mind perspective)

According to classroom observations, different roles of teachers / teacher assistants have been emerged. Evidence illustrates that different roles are significantly vital in order to help children with special needs with their academic performance. Consequently, roles consist of experts, coaches, parents, and teachers. Each role matches with appropriate perspectives as follow: (**expert role:** Clinical / diagnostic perspective; **coach role:** Developmental / life & work management perspective; **teacher role:** Diagnostic / didactic / pedagogic perspective; and **parent role:** Wellbeing / emotional / daily life perspective). While the researcher had observing the classroom, different roles of teacher and teacher assistant have been identified. With this respect, the researcher has detailed in observation and classroom activities in order to clarify different roles that teacher / teacher assistant might take during the lesson.

4.3.1 First classroom observation

A total of six mixed SEN students including (three boys with ADHD+; two ASD boys; and one girl with sensory processing difficulty) have been attended to the class. All ADHD and other children were on medication. Teaching methods that has been applied to the class was similar for three types of disorder. The main challenges of AD/HD children during the class were inattentiveness and distractibility. According to the conversation with teacher prior to the observations, all three ADHD children were intelligent and had a great potential of focusing to a subject they passionately interested in. However, the central concern of the classroom teacher and the teacher assistant was to motivate children through using different tools in order to attract their attention and stay focus. This important required other role of teacher called '***coaching***' which refers to ***developmental / life & work management*** perspective.

On the other hand lack of attention during the class made teaching even more difficult for teachers. Besides, behavioral issues disturbed others from paying attention to the lesson. With this respect, teacher assistant supported classroom management and helped manage students' behavior. Therefore, her act in the classroom presents the role '***coaching***'. Essentially she tried to establish good relationships with children in order to help them engage in the class activity efficiently. Hereafter, teacher assistant's role has been changed from coaching to '***parenting***'. Due to establishing good relationships with children, emotional perspective required in order to develop a friendship-learning environment. Overall, different roles of teacher and teacher assistant were significantly vital in the classroom in order to provide support (*appropriate pedagogy*) and help children overcome with their limitation.

4.3.2 Second classroom observation

A total of eight mixed SEN students including (3 boys with ADHD and ADHD+, 5 boys and girls multiple diagnosed ASD and learning difficulties) were attended to the class. According to pre observation discussion with the teacher, the researcher asked her viewpoint about ADHD. She explained, "*ADHD is all about behavioral complications that cause several challenges*". It seemed that teacher firstly has to recognize the struggle of a child in order to provide supports to help them

individually. This also indicates different perspective that might be taken by the teacher or teacher assistant. With this respect, '***diagnostic perspective***' of teacher required to recognize correct diagnosis of a child (*e.g.* attention deficit; autism; dyslexia; *etc.*). This important directs teacher to specify suitable pedagogy or strategy in order to develop child's abilities / skills.

The classroom included three ADHD students, which they were sitting together. This was pre-planned in order to group children with similar types of diagnosis. In fact, all children were on medication; otherwise, their behavioral matter causes many troubles. Several math games have been used for the lesson. This explains '***pedagogic***' perspective of teacher. When the teacher gave the mathematic task from the previous lesson, AD/HD children had delay to start solving the calculation. According to the brief conversation with both classrooms' teacher "*The sections of ADHDs' brain that process self-control / self-awareness and attention is not effectively active than it has to be*". Accordingly, this was in line with the literature (*e.g.* Barkley, 1997). Thus, teachers spent more time individually by asking questions and keep their brain fresh and focus on a lesson. Therefore, '***pedagogic***' and '***didactic***' perspectives of teacher were required. However, this may unlikely happen by teacher for the entire math's activity. Hence, teacher assistant had to help teacher and provide supports for children in order to follow instructions. Furthermore, Teacher clarified that "*based on my experience, it seemed that the more demands on their attention, the more problems become visible*". She recommended that game activities, puzzles, or using different educational tools could be beneficial and sustain children on task and engaging to the math tasks. Overall, this section has emphasized on teachers' pedagogic and didactic perspectives, which is significantly vital in order to facilitate educational strategies suitable for child's learning demands.

4.3.3 Third classroom observation

A total of five mixed SEN students including (two girls with sensory processing disorder and three boys with ADHD+) attended to the class. Although two types of disorder presented in the class (sensory processing disorder and ADHD+), similar teaching strategy have been used for teaching. Teacher and teacher assistant should spend similar time for both groups, since they had almost similar difficulties on tasks

given by the teacher. As teacher explained, it is important to note that there are different types of sensory processing disorder. According to the discussion with the teacher, there is not any relationship between sensory processing disorder and ADHD, since it is quite rare to find common impairments, having said that, "*there is a possibility of finding sensory processing problem among ADHD children rather than typically developing learners*". Interestingly, the main difficulties associated with these two girls in the classroom was 'organizing' and 'planning' a head in order to engage to the task. This therefore indicates the link between ADHD and sensory processing disorder. In fact, '***diagnostic***' perspective of teacher followed by '***developmental / life & work management***' here playing significant role in order to recognize correct diagnosis of children with special needs in the classroom, and help children how to manage certain disorder.

Teacher believed that visualization could be appropriate stimulants for both groups of ADHD and sensory processing disorder. Interestingly, both teacher and teacher assistant were assumed that visualization method could "*simply bring life to the lesson*", so ADHD children often perform well through visual techniques. Accordingly, this opinion likewise presents the '***pedagogic***' perspective taken by teacher. Moreover, teacher should then identify cognitive learning style of children in order to present learning material in a form that suitable for disorder types. When the mental math task was given to the children, the teacher had to simplify instructions. This means teacher and teacher assistant had to break down task into several subtasks to make it a lot easier for children. With such strategy, teacher can attract students' attention and keep their attention on more tasks. This might refers to the structure of ADHD's brain that unable do information processing in a productive manner which is in line with the literature review (*e.g.* Demeter *et al*., 2011).

4.3.4 Fourth classroom observation

The final classroom observation, a total of six mixed SEN students including (two boys with ADHD+; one girl with ADHD; and three boys with ASD) have been attended to the class. Teaching methods that have been applied to the class were mainly support social skills, since both groups of ADHD and ASD children have difficulties with communicational / social skills. With this respect, teacher's '***diagnostic***' perspective required in order to correctly recognize children's main

difficulties. According to the conversation with the teacher, both groups of ADHD and ASD are not willing to communicate with others or engage in group activities, especially girls, who show more shyness comparing to boys with ADHD. With this respect, teacher and teacher assistant had to take '***emotional***' perspective refers to '***parental role***' in a way to create good relationships with children. The parental role might effectively influence on children's social skills.

The class has started with reviewing the prior lesson in order to refresh children's memory skills. Teacher claimed, "*Making a prediction activates the students' prior knowledge. So, this prior knowledge facilitates their understanding of the new ideas or new concepts*". As explained in literature, poor working memory is one of the main constructs, which presents dysfunction between AD/HD children (French *et al*., 2003). Therefore, the main educational strategies that have been applied in this class were visualization in which picturing into the child's mind that what is happening. Teacher also claimed that, "*presenting pictorial information deliver different types of knowledge*". As such, '***pedagogic***' perspective of teacher would help children facilitate with an appropriate educational pedagogies.

Taken collectively, evidence of the use of different roles of teachers illustrates that ***7Ms*** (a set of mind perspective) need to be added into the ***6Ms*** Pedagogy Model. Accordingly, below represents different educational goals from each classroom activity in order to integrate with four roles of expert, coach, parent, and teacher.

Table 4-8: Educational Goals (1st Classroom)

Activity	Educational goals	Perspective
1	Build independence / using their motor skills	Parent / Teacher
2	Giving visual prompts / develop memory skills	Teacher
3	Demonstration through social story makes easy to understand learning material step by step	Teacher / Coach
4	Develop child's social interactions / friendship	Teacher / Parent
5	Gain child's attention / develop memory skills with pictures and colors	Expert / Teacher
6	Improve child's active participation within speech / Improve child' time management / Progress report to encouraging	Coach / Teacher
7	Provide fun learning, exciting and engaging / Develop attention skills / avoid them from extraneous stimuli	Teacher
8	Develop language skills / create words	Teacher
9	Develop peer-to-peer skills / friendships	Teacher
10	Target focusing skills / Stay on task	Teacher
11	Develop social skills / Improve behavioral disorder	Teacher / Coach
12	Teach child how to share things	Parent
13	Improve independency	Coach
14	Brain activity / Teach child how to think / Improve cognitive skills / Time management	Expert / Teacher
15	Teach them to follow rules	Parent / Teacher
16	Teach child how to share things	Parent

Source: Derived from teachers' interview

Table 4-9: Educational Goals (2nd Classroom)

Activity	Educational goals	Perspective
1	Build independence / using their motor skills	Parent / Teacher
2	Develop memory skills / Achieving knowledge through thoughts or senses	Expert / teacher
3	Develop thinking skills / Imagination	Expert
4	Develop child's social interactions	Parent / Teacher
5	Develop cognitive skills / Improve attentional skills	Teacher / Expert
6	Improve child's active participation within peers	Teacher
7	Improve their confidence / making decisions / develop communicational skills / Avoid them from being shy	Teacher
8	Develop thinking skills	Expert
9	Develop group work activities	Teacher
10	Develop self-esteem /Understand sharing	Parent
11	Improve independency	Parent / Teacher
12	Brain activity / Teach child how to think / Time management	Coach
13	Teach them to follow rules	Teacher
14	Interactions	Parent / Teacher

Source: Derived from teachers' interview

Table 4-10: Educational Goals (3rd Classroom)

Activity	Educational goals	Perspective
1	Develop child's social activity / Behavioral skills	Parent
2	Develop memory skills	Teacher / Expert
3	Develop peer-to-peer skills	Teacher
4	Improve child's active participation	Teacher
5	Visual prompts to improve attentional skills	Teacher
6	Improve math skills	Teacher
7	Encourage children making decisions	Parent / Coach
8	Develop thinking skills	Teacher
9	Develop confidence / avoid them from being shy	Coach
10	Develop group activity	Teacher
11	Improve independency	Coach
12	Social interactions / willing to share	Parent / Teacher
13	Teacher-student interaction	Teacher
14	Teach them being responsible	Parent / Teacher

Source: Derived from teachers' interview

Table 4-11: Educational Goals (4th Classroom)

Activity	Educational goals	Perspective
1	Develop child's organizing skills / discipline	Coach
2	Develop memory skills / improve communicational skills	Teacher /Expert
3	Planning skills / organizing skills	Coach
4	Enhance sociability / improve self- confidence	Teacher / Coach
5	Develop imagination / Understanding	Teacher / Coach
6	Develop memory / improve attentional skills	Teacher /Expert
7	Teach child to focus and keep focusing / build creativity	Teacher
8	Develop memory skills / Cognitive abilities / build child's confidence	Expert / Teacher
9	Learning new words	Teacher
10	Develop creativity	Teacher
11	Build independence	Parent / Teacher
12	Develop sharing skills / Interactions	Parent

Source: Derived from teachers' interview

4.3.5 Conclusion

According to earlier discussion in section 1, researcher was aimed to develop ***6Ms*** Pedagogy Model. With this respect, the researcher has detailed into the literature on the concept of pedagogy and relevant interpretations. 6Ms pedagogy model are including:

- Model of learning
- Mode of engagement
- Medium of delivery
- Method of facilitation
- Manner of feedback
- Map of content

Hereafter, the section 2 intended to validate the ***6Ms*** Pedagogy Model. Evidence from findings illustrates that the model has been approved, however, another 'M' is missing. Researcher' investigation indicates that ***7Ms*** needed. In order for ADHD learners to benefit from the pedagogy, it is necessary to adopt suitable interventions that will support theses learners in coping with their impairments as well as coping with their learning demands. The ***7Ms*** Pedagogy schema (mind perspective) introduced here permits designers to make reasons and controlled decisions about choice of pedagogy, perspectives, and the transition of pedagogy over the period of a learning episode. Consequently, the **7M** have to be added into Figure 4-2 presented earlier in section 2. In sum, adding 7Ms means that researcher needs to look at ADHD model, which will be explained in the following chapter.

Chapter Four: Data Collection/Qualitative Analysis/Findings: Part Two

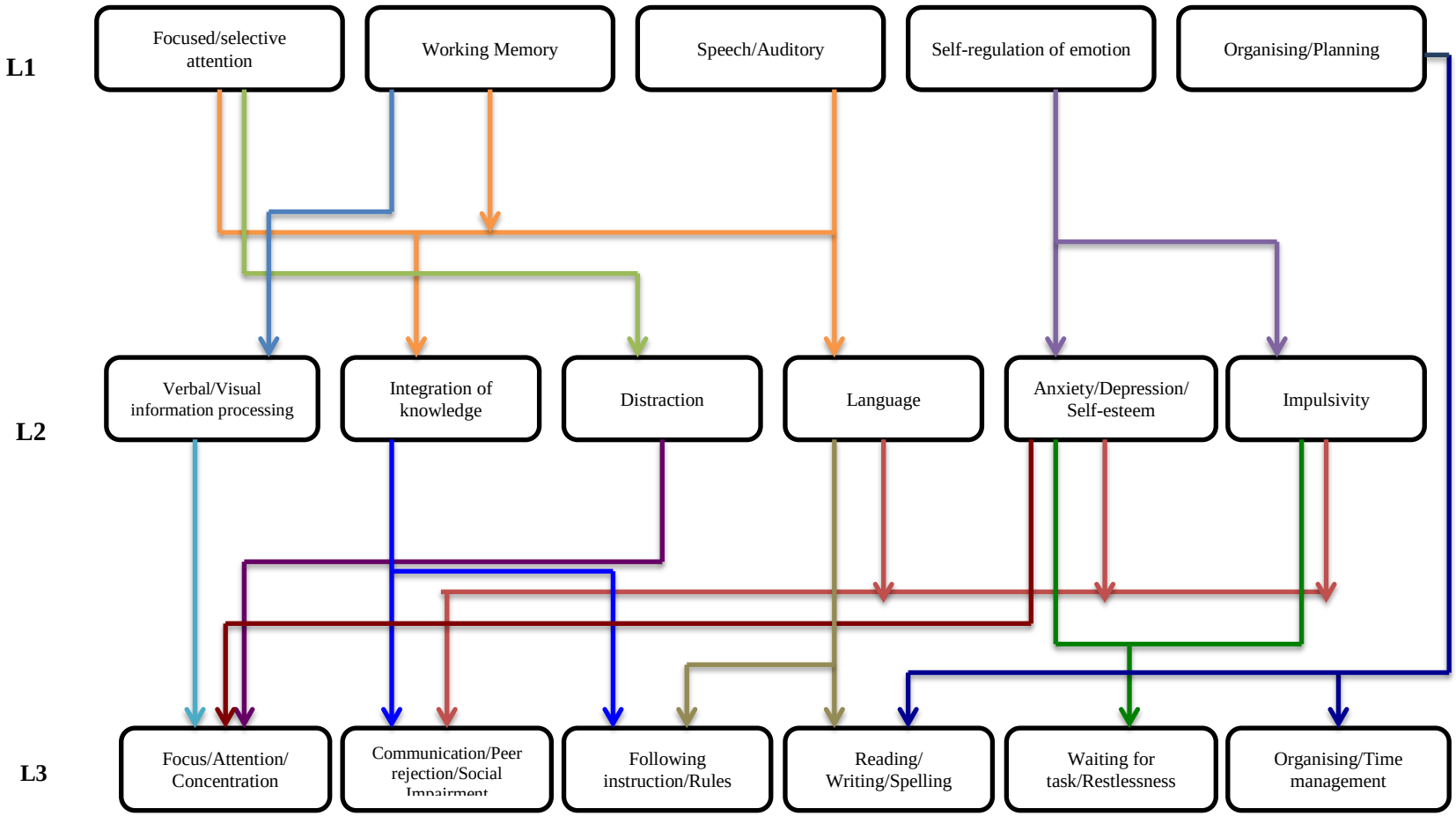
4.4 Section One: Aetiological Model of ADHD

This investigation aims to bridge the existing gap between the reasons for individual impairments and how to present learning materials to help children overcome their academic limitations. This can be achieved through developing a pedagogy schema that facilitates well-informed and targeted design decisions over pedagogy, which is an underdeveloped area. The model that has emerged through the exploratory and descriptive method will address the following statements:

- The link between cognitive deficit and internal effects
- The link between internal effects and observable symptoms

A novel aetiological model of ADHD has been developed based on two models by Barkley (1997) and Brown (2005). It is important to note that these two models do not focus in detail on the relationships between different impairments associated with ADHD children. It was necessary to investigate different associations with all chronic difficulties among ADHD children, since the developed model can reflect and allow teachers to understand the purpose of developing appropriate pedagogy for better practice. This represents the novelty of the ADHD model. The model is divided in three different levels of impairments that work continually together, called ***'dimensions***', as demonstrated in Figure 4-7. The three levels are *Cognitive deficits **(L1)**, Internal effects **(L2)**, and Observable signs **(L3)***. As discussed in the literature review, Barkley and Brown's model emphasized mainly cognitive impairments (L1), whereas the model of this study has further investigated in the relationships between different impairments. Therefore, the aetiological model of ADHD would help pedagogy designers to develop appropriate educational pedagogy for ADHD children in order to support their academic achievements.

Figure 4-7: Aetiological Model of ADHD



L1: *Cognitive effects*
L2: *Internal effects*
L3: *Observable signs*

Source: Developed for the purpose of this research

4.4.1 Clarification of the aetiological model of ADHD and its dimensions

As Figure 4-7 portrays, level one, '***Cognitive deficit***', investigated the cognitive performance of children with ADHD. Cognitive deficit is a set of impairments that act as a barrier towards cognitive performance, which relates the brain's function. Brain function can be associated with a wide variety of impairments that may present in early childhood. As explained in the literature review, cognitive deficits may arise from genetic syndromes or neurological disorders (Luman *et al*., 2010; Antshel, 2010); however, this is not the main concern of this thesis.

As shown in Figure 4-7, the cognitive deficits at level one include five impairments: focused/selective attention; working memory; speech/auditory; self-regulation of emotion; and organising/planning (Brakley, 1997; Goldstein, 2002; Tannock, 1998; Brown, 2009). Depending on each individual with ADHD, the level of deficits might fluctuate between poor and high (see Table 4-11).

At level two, '***Internal effects***', six intermediate factors are thought to be caused by the cognitive deficits in L1. These include: verbal/visual information processing; integration of knowledge; distraction; language; anxiety/depression/self-esteem; and impulsivity. Significantly, the cognitive deficit level does not lead directly to the observable symptoms. Hence, an intermediate level produces the causality effects placed in level three (see table 4-12).

Hereafter, the final level (L3) of the model will contain the '***Observable signs***' resulting from the internal factors in L2, which sequence complex engagements in education. According to Table 4-13, the six observable signs include: focus/attention/concentration; communication/peer rejection/social impairment; following instruction/rules; reading/writing/spelling; waiting for tasks/restlessness; and organising/time management. Hence, this research represents the model used to refer limitations and restrictions of ADHD children throughout their educational achievement. Consequently, the aetiological model illustrates the different challenges and difficulties associated with ADHD that reflect directly on educational disciplines. The following section will discuss the link between levels 1, 2 and 3.

4.4.2 Relationships between different levels (L1, L2, L3)

According to the purpose of this study, the researcher is not interested in examining in-depth the psychology of the brain and the brain dysfunction. This was simply due to the complexity of genetic reason behind the cognitive functions, which fell outside of the scope of the study. This research, therefore, focuses mainly on the relationships between cognitive level (L1), internal effects (L2) and observable signs (L3).

Section 1: L1 → L2

Leads to

4.4.2.1 ADHD impairments lead to integration knowledge

As explained in literature review, ***inattentiveness*** is one of the core impairments at the cognitive level (Guerin *et al*., 2009). According to DSM-IV (American Psychiatric Association (APA) 2000), inattentiveness includes the nine symptoms presented below. Six or more symptoms have to be present for a diagnosis of attention deficit disorders (ADD):

- Fails to attend to details
- Has difficulty sustaining attention
- Does not seem to listen
- Fails to finish
- Has difficulty organising tasks
- Avoids sustained effort
- Loses things
- Is directed by extraneous stimuli
- Is forgetful

Several studies have been conducted on focused and selective attention (Stelt *et al*., 2001). Since the brain's mechanisms on ADHD work differently from typical people, a number of attention challenges at the cognitive level have been discovered. In addition, inattentiveness may cause other chronic difficulties in ADHD. Investigation of the aetiological model represents the possible relations between

different impairments. Baddeley (1993) discussed the importance of the attention factor for integrating verbal and visual information within a context. According to the researcher's investigation, inattentiveness may contribute to difficulties in ***knowledge integration***. Integration of knowledge refers to generating integrative and coherent information in order to achieve meaningful learning. In this respect, the learner should actively recall prior knowledge from the working memory to integrate with the new concept. Poor focus and attention deficit could be one of the reasons behind poor integration knowledge that does not allow a child to select suitable information from a cluster of knowledge placed in their memory.

Numerous studies have been conducted on the links between ***poor working memory*** and ADD (French *et al*., 2003; Quinlan and Brown, 2003; Burgess *et al*., 2010). Clair-Thompson (2011) described working memory as a "*cognitive system responsible for storing and integrating information during complex activities*" (p.409). Investigation into the memory section indicates a number of working memory models. However, this research followed Baddeley's widely-accepted model. Baddeley (2002) has been cited in Quinlan and Brown's research (2003), stating that:

"*Integration and maintenance in memory of complex prose passage places heavy demands on working memory and executive processing*" (p. 148).

In other words, knowledge integration requires a high capacity of working memory for a cycle of holding, processing and retrieving information. Moreover, as Barkley stated in his inhibition model (1997), poor working memory has been introduced as one of the elements of executive function. Evidence illustrates that since ADHD's working memory does not respond well to the circle of responsibilities, this does not bode well for ADHD children to perform well on integrating prior knowledge to the new concept.

Speech and auditory problems have been identified as additional causes of poor knowledge integration. Mayer (2001) suggested the modality effects of multimedia learning for the purpose of improved learning performance. Based on his study, it is often beneficial to present learning materials in different modes (*e.g.* printed texts,

animation, video, pictures, audio, *etc*.). Although presenting information in multimedia environment has several advantages for typical learners, it requires students to have the ability to process and integrate simultaneously both visual and verbal information. Moreover, Rosen (2003), Hale *et al*., (2005), Gut *et al*., (2012) and Vandewalle *et al*., (2012) have proven speech and language difficulties between ADHD. Hence, problems with reading, writing and spelling are possibly rooted in auditory processing deficits. Since the majority of ADHD children are not able to process auditory information as well as typical learners (Rosen *et al*., 2010), they are barely able to integrate both verbal and visual information at the same time.

4.4.2.2 Poor attention leads to distraction

Distractibility is another behavioural disorder associated with ADHD children and adolescents (Mourik *et al*., 2007). Irrelevant information or extraneous activity may distract students' attention. In order to have an efficient cognitive function, selective attention is often required as it can filter out irrelevant tasks or activities. In fact, distraction often occurs through selective attention, which results in less attention being paid to the activity in which there are already involved (Parmentier, 2008). Goldstein (2002) asserted that 88% of ADHD children are easily distracted. In addition, Barkley in his interview also highlighted that poor sustained attention leads to distractibility. Greater difficulty has been observed between ADHD diagnosed children in preventing distractibility (Guerin *et al*., 2009; Loe *et al*., 2007; Brown, 2008). As a result, successful learning requires more attention, concentration, ignoring distractions, self-monitoring and remaining on task.

4.4.2.3 The link between memory and information processing

According to Clark and Paivio (1991), the idea of ***Dual-Coding Theory*** explains different information processing systems. Verbal and visual material has to be processed through different channels known as visual/verbal processing channels. Interconnection of the two channels is required in order integrate verbal and visual information. However, they act separately in terms of information processing (Paivio and Lambert, 1981). In addition, Miller suggested that individuals' working memory is able to hold only a limited amount of information. Baddeley (1999), cited in Austin (2009), also suggests, "*Human working memory system has limited capacity*

and is susceptible to overload" (p.1340). Limited capacity of working memory may restrict the amount of information being processed. Extraneous materials may cause overloading information in children's minds, followed by inefficient processing. In fact, difficulties have been associated with ADHD children when attempting to hold information, in addition to retrieving information in a particular order (French *et al*., 2003). Consequently, difficulty in either information mode may delay the processing channels.

4.4.2.4 The link between self-regulation of emotion and anxiety

Schunk and Zimmerman (1994), cited in Harris *et al*., (2004) defined self-regulation as the "*process whereby students activate and sustain cognitions, behaviors, and affects, which are systematically oriented toward attainment of their goals*" (p. 169). As Barkley explained (1997), attention-deficit hyperactivity disorder is also associated with emotional impairments. According to prior discussion on the literature, Barkley described ***self-regulation of emotion*** as a central feature of the executive function. Therefore, for the purpose of this research, self-regulation of emotion has been placed at level one of the model as a cognitive impairment. Barkley and Edward (1998) asserted, "*Deficits in emotion should be associated with self-motivation and self-control of arousal*" (p. 88).

Emotional impairments may contribute to *anxiety, depression, low self-esteem, and finally impulsivity* (Vloet *et al*., 2010; Saneei *et al*., 2011). Anxiety is an automatic alert when a child feels fear or threatened, and is a natural response. However, anxiety is not always a negative characteristic. In fact, some specialists believe that anxiety can help children stay focused and motivated to solve problems. In general, anxiety in ADHD is overwhelming, preventing a child from being functional. A number of studies have also investigated the link between ADHD, self-esteem and impulsivity (Matsuura *et al*., 2010; Tymms and Merrell, 2011). Moreover, low self-esteem may be associated with depression or aggressive behaviour, all of which result from poor self-regulation of emotion.

To conclude, this section offers another approach to the link between cognitive deficits (L1) in ADHD children and the internal effects (L2). In the discussion above, the common impairments and challenges of ADHD have been seated at an appropriate level. Hence, the attention has focused on existing associations between different impairments in order to develop an aetiological model of ADHD. In order to complete the discussion, the links between L2 and L3 are required to identify observable signs associated with ADHD, including: focus/attention/concentration; communication/peer rejection/social impairment; following instruction/rules; reading/writing/spelling; waiting for tasks/restlessness; and organising/time management.

Section 2: L2 → L3

Leads to

4.4.2.5 The link between poor attention and anxiety

Significantly, after many years of investigation, the causes of attention deficits remain unknown. Several studies indicate that ADD may result from hereditary disorders and genetics (Faigel *et al*., 1995; Barkley, 2006a). Interestingly, besides neurological reasons and genetics, Barkley stated in Tymms and Merrell (2011), "*Attention deficit associated with the predominantly inattentive subtype could be due to* ***slow information processing*** *and problems with selective attention*" (p.753). Longer duration of information processing has been observed between ADHD through the study of Toplak *et al*., (2006). This might refer to the inattentiveness type of ADHD. Consequently, evidence indicates an association between attention deficit, poor concentration, staying focused and slow information processing.

Distraction is one of the behavioural criteria of ADHD that influences directly attention (Mourik *et al*., 2007; Guerin *et al*., 2009). DSM-IV (1994) also emphasised that poor motor coordination between ADHD may be associated with poor attention, focus and distractibility when children engage with motor tasks. Hence, irrelevant stimuli (*e.g.* interesting events or subjects) could attract unconsciously children's attention. Importantly, severe ADHD symptoms may prevent children from sustaining attention and keep focusing on significant tasks. Consequently, suitable

interventions require decreased environmental distractions and improved levels of attention in children.

According to the studies of Vloet *et al*., (2010), 25% to 50% of ADHD diagnosed children have ***anxiety*** disorder, which illustrates a comorbid condition (Bowen *et al*., 2008). Therefore, high levels of anxiety may distract a child from concentration, staying focused on a particular task or activity and controlling their restlessness. Hence, individual learning performance and students' achievement may be reduced.

4.4.2.6 Reasons behind social impairments

The aetiological model presented here identifies three significant factors contributing to the social impairments of children with ADHD. From the outset, the study has examined the emotional reasons for social cognition: "*Successful social interaction is critically dependent upon our ability to understand other peoples' mind and their feeling*" (Uekermann *et al*., 2010; p.735). Behavioural performance has a direct influence on communication and social interaction. ***Impulsiveness*** is one of the ADHD characteristics indicating premature, impatient and thoughtless behaviour (Winstanley *et al*., 2006). ADHD children act before thinking, they blurt out answers before a question is completed, and they often find it difficult to wait for their turn (Barkley, 2003). Peer relationships are also significant as a primary context in which children learn how to collaborate, discuss, share knowledge and negotiate with their classmates. In fact, evidence illustrates that impulsive symptoms in individuals with ADHD does not allow children to both perform well in social environments and behave well with others (*i.e.* classmates, friends), which may contribute to peer rejection (Hoza, 2007). In addition, social impairments in ADHD are not limited simply to peer rejection. Difficulty in interaction between student-student and teacher-student, difficulty finding friends and maintaining relationships are also integrated. As a result, impulsive behaviour may to contribute peer rejection and communication impairments (Wehmeier, 2010).

Conversely, ***Anxiety or depression*** can be a cause of social impairments. A child with ADHD might be shy, exhibit aggressive behaviour, have major depression or lack confidence (***poor self-esteem***), all of which have impact negatively on their

social skills. Therefore, emotional impairments have been identified as a significant factor affecting a child's social skills (Lee *et al*., 2012; Becker *et al*., 2012).

Language deficit might be another reason for social impairments, identified in this research. Uekermann *et al*., (2010) stated, "*Social cognition abilities entail the ability to reason about mental states, empathy and humor processing*". Successful communication relates critically to understanding people's minds, language and feelings. Social information processing among ADHD children thus depends on language ability. Tannock (1998) illustrates that linguistic impairment as another thought reflects on the communicational system in ADHD, since it may reduce interaction between ADHD and typical learners. Significantly, the use of appropriate language and expression amongst ADHD contributes to better social performance.
Bodemr *et al*., (2004) suggested active ***integration of knowledge*** could expressly improve learning performance. As explained earlier, simultaneous integration of verbal and visual information and process information in dual channels may contribute to better learning outcomes (Mayer, 2001). Therefore, correct communication with knowledge is required in order to place textual information within the verbal channel and pictorial information within the visual channel.

4.4.2.7 Reasons behind Poor following of instructions/rules

According to previous studies, following instruction requires the correct reading of text, listening carefully to the speaker and being able to integrate the textual and pictorial information provided by the speaker or teacher (Fabio and Antonietti, 2012). Since individuals with ADHD have greater impairments on language processing and knowledge integration, they are unable to accurately follow instruction (Barkley and Edward, 1998). Following instructions requires high levels of attention, memory and language ability to understand the concept, hold it in the memory and retrieve the information. Therefore, such children often do not understand the language or integrate concepts to follow through on tasks, and fail to finish their duties or homework completely.

4.4.2.8 Reasons behind Poor reading/writing/spelling

Barkley and Brown categorised organisational skill as one of the executive function components (1997; 2005). Difficulties in organising, planning and time management are identified as impairments associated with ADHD (Gureasko-Moore *et al*., 2006; Langberg *et al*., 2011). Moreover, Barkley (2003) clarified that ADHD children often have difficulty organising tasks or activities. Forgetful, losing things, procrastination and missing assignment deadlines or appointments are other chronic organisational difficulties that make study more difficult for them. In addition, Rosenblum *et al*., (2010) claim that organisational ability is an essential component of good handwriting. In fact, it is vital to manage time, organise writing materials, structure and plan in advance what to write. In this respect, strong language ability is required in order to read, understand, write and spell any textual material. Importantly, this study has suggested that language deficit and poor organisational skills are two significant elements that lead to deficits in literacy skills.

It can be clearly seen from the model above that there is an arrow from poor organising/planning in L1 to organising/time management in L3. However, the term 'organising' in L1 refers to mental organisation, whereas in L3 it refers to planning ahead for life or academic area. The study has found strong link between these two terms.

4.4.2.9 Reasons behind restlessness

According to the previous discussion, behavioural disorder may create several difficulties for ADHD children. Impulsivity is defined as one of the core symptoms of behavioural impairments (human behaviour) in ADHD, which can be either beneficial or harmful in everyday lives. This means; "*The ability to act on impulse may allow us to seize a valuable opportunity, or to make a disastrous decision that we then live to regret*" (Winstanley *et al*., 2006; p. 380). However, a range of impairments has been identified so far. The two most recognisable components of impulsivity are '***waiting for a task***' and '***fidgeting or restlessness***'. These children often leave their seats and climb excessively. Overly talkative, hyper-energetic, hyperactive, shifting activity, becoming bored quickly, anxious behaviour and

impatience characteristics in ADHD do not permit them to ***wait for a new circle of task*** or activity (Barkley, 1997; 2003). This may result in interrupting the speaker or talking without permission (Ohan *et al*., 2011).

4.5 Conclusion

To conclude, this section initiates the investigation into a novel ADHD model called the aetiological model of ADHD. The novelty of this model has been established according to two criteria:

- Firstly, to classify ADHD impairments and place them at the right level (L1: Cognitive deficit, L2: internal effects, and L3: observable signs) which have been derived from the literature investigation

- Secondly, to determine the link between the different impairments of L1, L2, and L3 associated with ADHD

As explained in the literature review, Barkley's model focused mainly on the executive function (1997). Conversely, Brown's model (2005) highlighted the fundamental cognitive functions among ADHD pupils. Significantly, the aetiological model of ADHD presented in this study has been developed to identify different levels of impairments in addition to clarifying areas in which ADHD children display limitations/challenges that may result in academic failure. However, it is important to note that the new model of ADHD developed in this section needs to be validated through both empirical investigation and expert review. Hereafter, the study intends to develop a new pedagogical model (***7Ms***) to manage and support learning difficulties experienced by ADHD children.

The tables below cover all references based on the literature utilised to develop the aetiological model of ADHD.

4.6 Summaries of prior studies on Aetiological model components

Level 1

As can be seen from the aetiological model of ADHD presented in Figure 4-7, L1 presents cognitive impairments associated with ADHD, including: Focused/selective attention; working memory; speech/auditory; self-regulation of emotion; and organising/planning, presented as column headings in the table below. Therefore, each ADHD impairment presented in L1 has been supported by other researcher's work, which is referenced here.

Table 4-12: Level 1

L1 Reference	Focused/selective attention	Working memory	Speech /auditory	Self-regulation of emotion	Organising/planning
1	**Demeter *et al*., 2011.** Challenges to attention: A continuous arterial spin labeling (ASL) study of the effects of distraction on sustained attention.	**Baddeley, A. (1993).** Working memory or working attention? **In D.T. Stuss & R. T. Knight (Eds.),** Principles of frontal lobe function (pp. 246-260). New York: Oxford University Press.	**Hale *et al*., 2005.** Impaired linguistic processing and atypical brain laterality.	**Barkley and Edward (1998).** Attention deficit hyperactivity disorder.	**Langberg *et al*., 2011.** Refinement of an organizational skills intervention for adolescents with ADHD for implementation by school mental health providers.
2	**Barkley and Edward (1998).** Attention deficit hyperactivity disorder.	**French *et al*., 2003.** Short-term memory of children with and without characteristics of attention deficit hyperactivity disorder.	**Gut *et al*., 2012.** Language skills, mathematical thinking, and achievement motivation in children with ADHD, disruptive behavior disorders, and normal controls.	**Barkley, R. A. (1997).** Behavioral Inhibition, Sustained Attention, and Executive Functions: Constructing a Unifying Theory of ADHD	**Gureasko-Moore *et al*., 2006.** The effects of self-management in general education classrooms on the organizational skills of adolescents with ADHD.
3	**Shimoni *et al*., 2012.** Executive dysfunctions among boys with attention deficit hyperactivity disorder (ADHD): Performance-based test and parents report.	**Mayer and Moreno (2002).** Aids to computer-based multimedia learning.	**Vandewalle *et al*., 2012.** Auditory processing and speech perception in children with specific language impairment: Relations with oral language and literacy skills.	**Saneei *et al*., 2011.** Self-esteem and anxiety in human figure drawing of Iranian children with ADHD.	**Locascio *et al*., 2010.** Executive dysfunction among children with reading comprehension deficits.
4	**Barkley, R. A. (1997).** Behavioral Inhibition, Sustained	**Isaki and Plante (1997).** Short-term and working memory	**Rosen (2003).** Auditory processing in dyslexia and	**Wehmeier *et al*., 2010.** Social and emotional	

	Attention, and Executive Functions: Constructing a Unifying Theory of ADHD.	differences in language/learning disabled and normal adults.	specific language impairment: is there a deficit? What is its nature? Does it explain anything?	Impairment in children and adolescents with ADHD and the impact on quality of life.
5	**Tymms and Merrel, (2011).** ADHD and academic attainment: Is there an advantage in Impulsivity?	**Duyck *et al*., 2003.** Verbal working memory is involved in associative word learning unless visual codes are available.	**Tannock. R. (1998).** Attention deficit hyperactivity disorder: Advances in cognitive, neurobiological, and genetic research	
6	**Ponde *et al*., 2012.** Relationship between learning problems and attention deficit in childhood.	**Gathercole *et al*., 2006.** Working memory in the classroom.		
7	**Mourik *et al*., 2007.** When distraction is not distracting: A behavioral and ERP study on distraction in ADHD.	**Brooks and Shell (2006).** Working memory, motivation, and teacher-initiated learning.		
8	**Brown, T. E. (2005).** Attention Deficit Disorder: The Unfocused Mind in children and adults: Yale University press			

Level 2

L2 presents the internal effects shown in Figure 4-7 as previously explained, including: verbal/visual information processing; integration of knowledge; distraction; language; anxiety/depression/self-esteem; and impulsivity. An investigation of the literature highlights that other researchers have explored different ADHD impairments, which are presented in each column in the table below.

Table 4-13: Level 2

L2 Reference	Verbal/Visual information processing	Integration of knowledge	Distraction	Language	Anxiety/Depression/Self-esteem	Impulsivity
1	**Fabio and Antonietti (2012).** Effects of hypermedia instruction on declarative, conditional and procedural knowledge in ADHD students.	**Dutke and Rinck (2006).** Multimedia learning: Working memory and the learning of word and picture diagrams.	**Mourik *et al*., 2007.** When distraction is not distracting: A behavioral and ERP study on distraction in ADHD.	**Hale *et al*., 2005.** Impaired linguistic processing and atypical brain laterality.	**Vloet *et al*., 2010.** Impact of anxiety disorders on attentional functions in children with ADHD.	**Hermon-Jones *et al*., 1996.** Impulsiveness, aggression, reading, and the p300 of the event-related potential.
2	**Jamet *et al*., 2008.** Attention guiding in multimedia learning.	**Jamet *et al*., 2008.** Attention guiding in multimedia learning.	**Guerin *et al*., 2009.** The psychometric properties of the attention-distraction, inhibition-excitation classroom assessment scale (ADIECAS) in a sample of children with moderate and severe intellectual disabilities.	**Gut *et al*., 2012.** Language skills, mathematical thinking, and achievement motivation in children with ADHD, disruptive behavior disorders, and normal controls.	**Becker *et al*., 2012.** Aggression among children with ADHD, anxiety, or Co-occurring symptoms: Competing Exacerbation and attenuation hypotheses.	**Tymms and Merrell (2011).** ADHD and academic attainment: Is there an advantage in impulsivity?
3	**Genuchten *et al*., 2012.** Examining learning from text and pictures for different task types: Does the multimedia effect differ for conceptual, causal, and procedural tasks?	**Bodemer *et al*., 2004.** The active integration of information during learning with dynamic and interactive visualization.	**Loe *et al*., 2007.** Academic and educational outcomes of children with ADHD.	**Vandewalle *et al*., 2012.** Auditory processing and speech perception in children with specific language impairment: Relations with oral language and literacy skills.	**Saneei *et al*., 2011.** Self-esteem and anxiety in human figure drawing of Iranian children with ADHD	**Carlotta *et al*., 2011.** The role of impulsivity, sensation seeking and aggression in the relationship between childhood AD/HD symptom and antisocial behavior in adolescence.

4	**Seufert *et al*., 2009.** Memory characteristics and modality in multimedia learning: An aptitude-treatment-interaction study.	**Allen and Hulme, 2006**. Speech and language processing mechanisms in verbal serial recall.	**Matsuura *et al*., 2010.** The characteristics of AD/HD symptoms, self-esteem, and aggression among serious juvenile offenders in japan.	**Winstanley *et al*., 2006.** Behavioral models of impulsivity in relation to ADHD: Translation between clinical and preclinical studies.
5		**Rosen (2003).** Auditory processing in dyslexia and specific language impairment: is there a deficit? What is its nature? Does it explain anything?	**Biederman *et al*., 1998.** Depression in attention deficit hyperactivity disorder (ADHD) children; "True" depression or demoralization?	**Barkley and Edward (1998).** Attention deficit hyperactivity disorder.

Level 3

L3 indicates observable impairments associated with ADHD children, comprising: focus/attention/concentration; communication/peer rejection/social impairment; following instruction/rules; reading/writing/spelling; waiting for tasks/restlessness; and organising/time management. It can be clearly seen from Table 4-14 that prior research has investigated the different ADHD impairments presented below.

Table 4-14: Level 3

L3 Reference	Focus/Attention/ Concentration	Communication/ Peer rejection/Social Impairment	Following instruction/Rules	Reading/ Writing/Spelling	Waiting for task/Restlessness	Organising/Time management
1	**Demeter *et al*., 2011.** Challenges to attention: A continuous arterial spin labeling (ASL) study of the effects of distraction on sustained attention.	**Uekermann *et al*., 2010.** Social cognition in attention-deficit hyperactivity disorder (ADHD).	**Goldstein (2002).** Continuity of ADHD in adulthood: Hypothesis and theory meet reality.	**Frazier *et al*., 2008.** Detection of stimulated ADHD and reading disorder using symptom validity measures.	**Ohan *et al*., 2011.** Teachers' and education students' perceptions of and reactions to children with and without the diagnostic label "ADHD"	**Langberg *et al*., 2011.** Refinement of an organizational skills intervention for adolescents with ADHD for implementation by school mental health providers.
2	**Barkley and Edward (1998).** Attention deficit hyperactivity disorder.	**Wehmeier *et al*., 2010.** Social and emotional impairment in children and adolescents with ADHD and the impact on quality of life.	**Tan and Cheung (2008).** Effects of computer collaborative group work on peer acceptance of a journal pupil with attention deficit hyperactivity disorder.	**Gut *et al*., 2012.** Language skills, mathematical thinking, and achievement motivation in children with ADHD, disruptive behavior disorders, and normal controls.	**Barkley (2003).** Issues in the diagnosis of attention-deficit/hyperactivity disorder in children.	**Gureasko-Moore *et al*., 2006.** The effects of self-management in general education classrooms on the organizational skills of adolescents with ADHD.
3	**Shimoni *et al*., 2012.** Executive dysfunctions among boys with attention deficit hyperactivity disorder (ADHD): Performance-based test and parents report.	**Tan and Cheung (2008).** Effects of computer collaborative group work on peer acceptance of a journal pupil with attention deficit hyperactivity disorder.	**Barkley (2003).** Issues in the diagnosis of attention-deficit/hyperactivity disorder in children.	**Cheng *et al*., 2011.** Reading and writing performances of children 7-8 years of age with developmental coordination disorder in Taiwan.		**Locascio *et al*., 2010.** Executive dysfunction among children with reading comprehension deficits.
4	**Barkley, R. A. (1997).** Behavioral Inhibition,	**Watkins and Wentzel (2008).** Training boys				

	Sustained Attention, and Executive Functions: Constructing a Unifying Theory of ADHD.	with ADHD to work collaboratively: Social and learning outcomes.
5	**Tymms and Merrel, (2011).** ADHD and academic attainment: Is there an advantage in Impulsivity?	
6	**Ponde *et al*., 2012.** Relationship between learning problems and attention deficit in childhood.	
7	**Mourik *et al*., 2007.** When distraction is not distracting: A behavioral and ERP study on distraction in ADHD.	
8	**Brown, T. E. (2005).** Attention Deficit Disorder: The Unfocused Mind in children and adults: Yale University press	

Level 1/Level 2

In Table 4-15, the first row presents ADHD impairments from cognitive level (L1), while the first column represents other ADHD impairments from Level 2 (internal effects). This table identifies the relationships between different impairments associated with ADHD. In this respect, the current research provided prior studies emphasising the link between symptoms. However, there are some areas that demonstrate no relation.

Table 4-15: L1/L2

L1 L2	Focused/selective attention	Working memory	Speech/auditory	Self-regulation of emotion	Organising/planning
Verbal/Visual information processing	**N/A**	**Baddeley, A. (2002).** Working memory or working attention? In D.T. Stuss & R. T. Knight (Eds.), Principles of frontal lobe function (pp. 246-260). New York: Oxford University Press. **Mayer, R. E. (2001).** Multimedia learning. New York: Cambridge University Press	**Seufert *et al*., 2009.** Memory characteristics and modality in multimedia learning: An aptitude-treatment-interaction study. **Allen and Hulme, 2006**. Speech and language processing mechanisms in verbal serial recall.	**N/A**	**N/A**
Integration of knowledge	**Baddeley, A. (1993).** Working memory or working attention?	**Seufert *et al*., 2009.** Memory characteristics and modality in multimedia learning: An aptitude-treatment-interaction study.	**Seufert *et al*., 2009.** Memory characteristics and modality in multimedia learning: An aptitude-treatment-interaction study.	**N/A**	**N/A**
Distraction	**Demeter *et al*., 2011.** Challenges to attention: A continuous arterial spin labeling (ASL) study of the effects of distraction on sustained attention.	**N/A**	**N/A**	**N/A**	**N/A**
Language	**Hale *et al*., 2005.** Impaired linguistic processing and atypical brain	**Gathercole and Baddeley (1990).** Phonological memory deficits in language	**Hale *et al*., 2005.** Impaired linguistic processing and atypical brain laterality. **Tannock. R. (2004).**	**N/A**	**Rosenblum *et al*., 2010.** Relationships between handwriting performance and

	laterality. **Tannock. R. (2004).** Language and mental health disorder: the case of ADHD	disordered children: Is there a causal connection?	Language and mental health disorder: the case of ADHD.		organizational abilities among children with and without dysgraphia: A preliminary study.
Anxiety/Depression/Self-esteem	**N/A**	**N/A**	**N/A**	**Saneei *et al*., 2011.** Self-esteem and anxiety in human figure drawing of Iranian children with ADHD. **Vloet et al., 2010.** Impact of anxiety disorders on attentional functions in children with ADHD.	**N/A**
Impulsivity	**N/A**	**N/A**	**N/A**	**Saneei *et al*., 2011.** Self-esteem and anxiety in human figure drawing of Iranian children with ADHD. **Vloet *et al*., 2010.** Impact of anxiety disorders on attentional functions in children with ADHD.	**N/A**

Level 2/Level 3

Similar to the previous table, Table 4-16 provides impairments arising from internal effects (L2), and observable symptoms (L3). The literature investigation shows the relationships between noted impairments since prior authors have supported links in the areas. However, there are some areas that present no relation between impairments.

Table 4-16: L2/L3

L2 L3	Verbal/Visual information processing	Integration of knowledge	Distraction	Language	Anxiety/Depression/Self-esteem	Impulsivity
Focus/Attention/Concentration	**Tymms and Merrell (2011).** ADHD and academic attainment: Is there an advantage in impulsivity? **Loh *et al*., 2011.** Combined ADHD and DCD: Examining cognitive functions using the WISC-IV.	**N/A**	**Mourik *et al*., 2007.** When distraction is not distracting: A behavioral and ERP study on distraction in ADHD. **Guerin *et al*., 2007.** The psychometric properties of the attention-distraction, inhibition-excitation classroom assessment scale (ADIECAS) in a sample of children with moderate and severe intellectual disabilities.	**N/A**	**Vloet *et al*., 2010.** Impact of anxiety disorders on attentional functions in children with ADHD. **Barkley (2003).** Issues in the diagnosis of attention-deficit/hyperactivity disorder in children.	**N/A**
Communication/Peer rejection/Social Impairment	**N/A**	**Bodemer *et al*., 2004.** The active integration of information during learning with dynamic and interactive visualization.	**N/A**	**Tannock. R. (2004).** Language and mental health disorder: the case of ADHD.	**Wehmeier *et al*., 2010.** Social and emotional impairment in children and adolescents with ADHD and the impact on quality of life. **Becker *et al*., 2012.** Aggression among children with ADHD, anxiety, or Co-occurring symptoms: Competing Exacerbation and attenuation hypotheses. **Lee *et al*., 2012.** Association of comorbid anxiety with social functioning in school-age children with and without attention-deficit/hyperactivity	**Carlotta *et al*., 2011.** The role of impulsivity, sensation seeking and aggression in the relationship between childhood AD/HD symptom and antisocial behavior in adolescence. **Uekermann *et al*., 2010.** Social cognition in attention-deficit hyperactivity disorder (ADHD).

				disorder (ADHD).		
Following instruction/ Rules	**N/A**	**Fabio and Antonietti (2012).** Effects of hypermedia instruction on declarative, conditional and procedural knowledge in ADHD students.	**N/A**	**Hale *et al*., 2005.** Impaired linguistic processing and atypical brain laterality. **Vandewalle *et al*., 2012.** Auditory processing and speech perception in children with specific language impairment: Relations with oral language and literacy skills.	**N/A**	**N/A**
Reading/Writing/Spelling	**N/A**	**N/A**	**N/A**	**Cheng *et al*., 2011.** Reading and writing performances of children 7-8 years of age with developmental coordination disorder in Taiwan.	**N/A**	**N/A**
Waiting for task/Restlessness	**N/A**	**N/A**	**N/A**	**N/A**	**Ohan *et al*., 2011.** Teachers' and education students' perceptions of and reactions to childrenwith and without the diagnostic label "ADHD" **Barkley (2003).** Issues in the diagnosis of attention-deficit/hyperactivity disorder in children.	**Ohan *et al*., 2011.** Teachers' and education students' perceptions of and reactions to children with and without the diagnostic label "ADHD" **Barkley (2003).** Issues in the diagnosis of attention-deficit/hyperactivity disorder in children.
Organising/ Time management	**N/A**	**N/A**	**N/A**	**Rosenblum *et al*., 2010.** Relationships between handwriting performance and organizational abilities among children with and without dysgraphia: A preliminary study.	**Barkley (2003).** Issues in the diagnosis of attention-deficit/hyperactivity disorder in children.	**Barkley (2003).** Issues in the diagnosis of attention-deficit/hyperactivity disorder in children.

Source: Developed for the purpose of this research

4.7 Section Two: Validating the aetiological Model

This analysis section presents the qualitative results yielded from 20 semi-structured interviews. Hereafter, the raw data will be narrowed down utilising a number of techniques as described in the methodology chapter. The purpose of using a qualitative method in this exploratory research is to perform an in-depth investigate in order to enhance the understanding of the points below:

- To establish that there are different roles
- To determine the differences between roles
- To specify the suitability of roles with pedagogy in the classroom
- To identify lesson plans and different teaching strategies
- To recognise types of ADHD, the main challenges and learning difficulties at school, behavioural issues and the relationships between impairments.

More precisely, the qualitative analysis in this research has been divided into the following sections:

- ***Aetiological Model of ADHD***
    - Section1: Experts' view
    - Section 2: Coaches' view
    - Section 3: Teachers' view
    - Section 4: Parents' view
    - Section 5: The link between learning criteria and ADHD
    - Section 6: Comparison of perspectives

This section begins with an indication of the qualitative data analysis procedure that offers a preliminary analysis of the empirical study used to validate the aetiological model of ADHD. In this respect, findings were identified and categorised based on the models, main variables and perceptions. Furthermore, findings were coded according to the themes and sub-themes emerging from the content analysis. In addition, the analysis followed grounded theory to search for new codes. One of the main advantages of coding is to force the researcher "*to understand what is still unclear by putting names on incidents and events, trying to cluster them, communicating with others around some commonly held ideas, and trying out*

enveloping concepts against another wave of observations and conversations" (Mile and Huberman, 1994; p.62).

Code revision is required in order to recheck and redefine generated codes. This has happened several times since some codes were not appropriate. Hereafter, the researcher had to discuss coding with another colleague (teacher); thereby, adding potentially more validity and reliability to the analysis. Consequently, the section describes the inclusive qualitative results relevant to each theme.

The data analysis below aimed to verify the aetiological model of ADHD derived from the literature. Analysis was based on the data yielded from four groups of interviewees (Experts, Coaches, Parents, and Teachers). The groups outlined how people view the aetiological model of ADHD differently, which is in line with the critical reality epistemology explained in Chapter 3. As a result, such models are introduced and discussed systematically in this section.

4.8 Section One: Experts' view

This section consists of an analysis of experts' discussion about children diagnosed with ADHD and their impairments. The process of data collection is described in Chapter 3 (section: 3.11.2). Table 4-17 below has been generated based on qualitative content analysis (Experts' view), which indicates the list of key themes, sub-themes and coding. The themes were taken from Barkley and DSM-IV in a positive epistemology. The last column on the right represents the outcome of interview analysis, which directs the researcher to the aetiologic model of ADHD. Accordingly, the following sections of this chapter will go through each theme individually.

Table 4-17: Thematic and Coding Schema (I)

Group	Key themes	Sub-themes	Codes	Outcomes
1	**Behaviour**	-Energetic	BE: ENE	**ADHD Model: Causal effects** ***Clinical view***
		-Distracting	BE: DIS	
		-Noisy	BE: NOI	
		-Impulsiveness	BE: IMP	
		-Anxious/being aggressive/screaming tantrum/shouting	BE: ANX	
		-Emotional problem	BE: EMO	
		-Negative self-talk/negative thinking/depression	BE: NEG	
2	**Challenges**	-Inattentiveness	CH: INA	
		-Hyperactivity/cannot sit still	CH: HYP	
		-Impulsivity/not patient/restlessness/low frustration tolerance/give up quickly	CH: IMP	
		-Working memory/forget details/loses assignments/missing deadlines	CH: WM	
		-Social skills	CH: SOC	
		-Depression/low self-confidence/low self-esteem	CH: DEP	
		-Over-focus	CH: OVE	
		-Self-control and self-regulation	CH: SEL	
		-Distractibility	CH: DIS	
		-Time management/organising for life and academic/planning	CH: TIM	
		-Literacy skills/reading/writing/listening	CH: LIT	
3	**Difficulties at school/in the classroom**	-Hyperactive/energetic	DIF: HYP	
		-Learning difficulties	DIF: LEA	
		-Memory failure/forgetful	DIF: MEM	
		-Information processing	DIF: INF	
		-Distraction/disruptive behaviour/interruption	DIF: DIS	
		-Communication/social skills	DIF: COM	
		-Self-control	DIF: SEL	
		-Follow instruction/direction/rules	DIF: FOL	
		-Academic failure	DIF: ACA	
		-Failure to understand speech	DIF: FAI	
		-Blurting out answers	DIF: BLU	
		-Focusing and concentration	DIF: FOC	
4	**Learning difficulties**	-Memory failure/retrieve information	LE: MEM	
		-Information processing verbally	LE: INF	
		-Math problem/dyscalculia	LE: MAT	
		-Distraction/disruptive behaviour/interruption	LE: DIS	
		-Literacy skills/reading/writing/listening	LE: LIT	
		-Follow instruction	LE: FOL	
		-Inattentiveness/lack of attention and concentration/shifting attention to other things	LE: INA	
		-Collaboration/group activity	LE: COL	
		-Losing time	LE: LOS	
5	**Attention challenges**	-Distractions	ATT: DIS	
		-External or internal events	ATT: EXT	
		-Visually sensitive/sensitive to bright colours/sensitive to colours	ATT: VIS	
6	**Causality in a restricted sense Reasons for inattentiveness**	-Genetic reasons	REA: GEN	
		-Dopamine	RED: DOP	
		-Distraction	REA: DIS	
		-Sleep	REA: SLE	
		-Stress is great enemy	REA: STR	
		-Physical exercise	REA: PHY	
		-External or internal events	REA: EXT	
		-Visually sensitive/sensitive to bright	REA: VIS	

		colours/sensitive to colours	
		-Brain function/controlling system in brain/misconnection between frontal brain and back part	REA: BRA
		- Activity engagement	REA: ACT
		- Motivation	REA: MOT
7	**Communicational/social difficulties**	-Peer rejection	COM: PEE
		-Making friends/keep friendship	COM: MAK
		-Collaboration	COM: COL
		-Active engagement	COM: ACT
8	**Solutions to overcome social difficulties**	-Talk to friends	SOL: TAL
		-Engage in discussion/being active/join to a local support group	SOL: ENG
		-Sharing ideas	SOL: SHA
		-Break long tasks into several steps	SOL: BRE
9	**Organisational skills**	-Time management	ORG: TIM
		-Prioritising/sequencing	ORG: PRI
		-Planning a head	ORG: PLA
		-Forget things/missing appointments/deadlines	ORG: FOR
		-Organising their homework/organising in writing	ORG: ORG
		-Schedule	ORG: SCH
10	**Solutions to overcome organisational difficulties**	-Children need structure	SOL: STR
		-Motivation/rewards	SOL: MOT
		-Organising can prevent	SOL: ORG
		-Using symbols/using pictures/colour-coding papers	SOL: SYM
		-Using folders, notebooks	SOL: FOL
		-Using calendar/timetable	SOL: CAL
		-Using tools like mobile or computer	SOL: TOO
		-Using clock	SOL: CLO
		-Break tasks into sub tasks	SOL: BRE
		-Writing down needed materials and put it as a checklist	SOL: WRI
11	**Important issues about ADHD**	-Understanding and recognising correct diagnose	IMP: UND
		-Symptoms	IMP: SYM
		-Parenting	IMP: PAR
		-Good diet	IMP: GOO
		-Correct medication	IMP: MED
		-Not labelling	IMP: LAB
		-Effective teaching strategies	IMP: EFF

Source: Derived from the empirical data

4.8.1 ADHD behaviour

According to the literature, ADHD is a common neurobehavioral disorder that affects many school-aged children (Schwean *et al*., 1993). Interviews with experts highlighted various behavioural disorders that are considered common impairments. Experts believed that all parents and teachers want their children and pupils to be well adjusted both at home and at school. For instance, one expert noted that "*The most important part for pure ADHD is being* ***energetic*** *and* ***hyperactive****…basically; it is not a disorder unless the* ***impulsiveness*** *comes up*" (Expert 1).

This beahvioural disorder has occurred more frequently in ADHD children than in typical learners. Of course, these children have problems controlling their emotions; they suffer with severe depression, hyperactivity, anger and aggression. Conversely, according to the themes and sub-themes expressed in Table 4-16 above, negative self-talk, self-awareness and negative self-image (negative thoughts like mind reading, fortune telling, personalising, minimisation) are other aspects of behavioural problems associated with ADHD, highlighted by all respondents. Receiving constantly large amounts of negative environmental messages from parents, teachers, friends and even medicines could lead children to experience negative self-talk. In this respect, an expert stated that; "…*For instance, I am always late, I never can do anything right. To that end, finding statements to rephrase I am usually late but I try to do it. That might help to think about things positively*" (Expert 6).

To conclude, children with ADHD struggle with behavioural disorders and various symptoms that interfere directly in their daily lives. Negative messages of self-talking among ADHD children are also counted as a significant problem. Evidence from experts explains that children require a great deal of support and clinical treatment in order to succeed both in their academic and social lives.

4.8.2 Main challenges of ADHD

In fact, all expert respondents agreed that ADHD is often present with three main challenges: inattention, hyperactivity and impulsivity. However, we cannot ignore the other impairments associated with ADHD. When the researcher asked experts to define the main challenges of having ADHD, all referred to different versions of ADHD. In this respect, one of the experts comments "*Your version of ADHD might be very different from others in terms of their symptoms…*" (Expert 2).

Interestingly, this comment is in line with literature review since different types of ADHD have been explained (*i.e.* attention deficit; hyperactivity; and combined). There are many connotations of ADHD. Hence, experts directed the researcher to numerous symptoms that often elevate ADHD to **ADHD +**. Therefore, the evidence emerging from the respondents gives the impression that ADHD is not a disorder of knowledge and intelligence, but rather one of using knowledge. Accordingly, an

expert noted, "*Brains signal failure occurs when a child with AD/HD attempts a task that requires experiences or paying particular attention…*" (Expert 7).

Therefore, as highlighted in the literature (Barkley, 2006a), two parts of the brain are disconnected and it is very difficult to connect them. To do so requires significant effort to support children with such limitations.

4.8.3 ADHD at school/in the classroom

As highlighted in Table 4-17, it is clear that students with ADHD experience numerous difficulties in schools or academic environments. Expert explanations are based on the fact that the child's learning difficulties determine ADHD, compared with typical learners struggling with academic achievements. Academic failure results in low average marks followed by diminishing motivation to compete. Evidence from experts' interviews revealed two major problems that affect negatively the learning process: '*inattentiveness'* and '*poor working memory'*. A professional ADHD expert argued that poor memory skills have been identified as being associated closely with significant aspects of learning. A child with a learning disability cannot try harder, pay closer attention or keep focusing on a particular task, which is removed from his/her interests. In this respect, one of the experts noted that; "*These pupils have normal intelligence or higher, but they may experience difficulties* ***storing information*** *and* ***recall*** *when required.* ***Concentration*** *and* ***keeping focus*** *are the other challenges that causes learning failure. There is no reason to blame them for having a kind of disorder*" (Expert 4).

Hence, there is considerable evidence from all seven experts that links ADHD to academic achievements. Consequently, the findings suggest that schools support the design of appropriate educational pedagogies to help such children meet the learning criteria. Therefore, teachers are responsible for recognising which instructional practices will meet the child's learning difficulties and identified behavioural needs. Furthermore, a selection of practices that fit the learning materials is required in order to attain the child's attention. More importantly, educational pedagogies must reflect the goals for different types of disorders (*i.e.* attention deficit, hyperactivity, *etc.*) to supply the necessary learning requirements.

4.8.4 Attention challenges

Experts identified attention as a ***central construct in cognitive process,*** which is in line with the literature reviewed (Sarter *et al*., 2001). Understanding the nature of attention is crucial and the researcher has focused on the attention variable as one of the main concerns. William James (2007) explained attention in his book as follows:

"*Everyone knows what attention is. It is the taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought. Focalizations, concentration, of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others, and is a condition which has a real opposite in the confused, dazed, scatterbrained state which in French is called distraction and Zerstreutheit in German*" (P. 403-404).

In fact, many different functions in the mind contribute to attention. Interestingly, an expert explains that attention means being aware of something presented in front of us. The ability to focus and sustain attention over long periods of time is a significant factor; for instance, listening to a lecture. Results from the experts' discussion outline some of the challenges to attention: distractors, fatigue, sickness and behavioural processes. Distractors are identified as major to sustain attention, which may result in reduced learning performance. Therefore, attention effort is required in order to succeed in learning. Interestingly, one of the experts noted: "*Teachers complain that ADHD children don't seem able to focus or concentrate on a task or activity. It doesn't matter what it is. They* ***are fidgeting*** *and* ***buzz*** *around the class, playing with their pencils and distracting other children*" (Expert 5).

To emphasise more on attention skills, when questioning the nature of attention and attention challenges from the interviewees, several aspects emerged in relation to the reason behind the attention difficulties addressed in the following section.

4.8.5 Reasons for inattentiveness

Distraction

Expert interview participants expressed many different reasons why ADHD children have poor attention. This is consistent with the literature review, since the researcher has emphasised distraction through the framework.

According to the experts, around 80% of possible causes of attention disorder are genetic, which is a huge percentage. So, what about the remaining 20%? Environmental factors would affect attention problems. In addition to the experts' claim, the following comment was received: "*Several causes are involved, however, the exact reason of having ADHD is not yet clear. Obviously there is a link between ADHD and genetic, but other environmental factors could engage…*" (Expert 7).

Unsurprisingly, this is in line with the literature (*e.g.* Faraone *et al*., 2005) and is supported by the experts. One of the behavioural manifestations of ADHD children was identified as their abnormal distractibility. Distractors may vary in different children; for instance, one child might be ***visually sensitive***, so s/he could be distracted by bright colours. Sometimes, things in an ADHD's visual sphere are distracting. Conversely, another might be ***verbally*** or ***auditory*** sensitive. For instance, any external noises may distract children from paying attention. Being over-sensitive to smells like perfume likewise can distract children from maintaining focus.

Brain function

Evidence from expert reveals that brain abnormalities are associated with an ADHD diagnosis. In this respect, a comment was received: "*Dopamine is a chemical hormone in the brain, identified as a Neurotransmitter, which plays significant role in the brain. So the lack of dopamine causes several conditions, for example, attention deficit disorder*" (Expert 2).

Reviewing the literature also revealed that, "*the functional abnormalities in ADHD not only affect isolated brain regions but also the functional inter-regional interconnectivity between these regions*" (Cubillo *et al*., 2012 p. 196). There is a misconnection between the frontal brain and back part of the brain, which is

frequently expressed by the experts. The front brain is identified as the '*doing*' part, while the back brain is the '*knowing or knowledge*' part. The problem is these two parts of the brain are disconnected and very complex to connect. In other words, the brain's controlling system does not response well to the stimuli. It is more important to note that a child with ADHD often knows what to do to achieve the next level, but the brain does not allow him/her to move forward. Consequently, experts have found that we need all neurotransmitters to be balanced in order to have an adequate attention span. This is the reason why medication has been used as an effective treatment for nearly half a century. In this respect, results present that over 80% of ADHD children receive noticeable benefit from their medication (Clarke *et al*., 2003).

Lack of sleep

Lack of sleep among school-aged children has been identified as another reason for ADD. Findings from the interviews have shown that approximately 70% of diagnosed children have sleep disorder, although sleep problems have not identified as a common feature of developmental disorder in children. However, lack of sleep may exacerbate other impairments. In this respect, one expert pointed out that, "a *sleep disorder affects significantly attention, concentration, and cognitive performance*" (Expert 4). Moreover, lack of sleep may enhance behavioural disorders, such as impulsiveness or hyperactivity. Therefore, effective behavioural interventions are required in order to solve this problem.

Stress

Stress can influence humans' mental state and thinking, physical and emotional symptoms. Participants approved the impact of stress on processing attention, which is in line with the literature. There is significant evidence linking stress to selective attention (Ellenbogen and Schwartzman, 2009). Too much stress can cause numerous problems in daily life. In this respect, one of the experts' comments; "*Stress is great enemy to distract our mind and stop us from paying attention and concentrating*" (Expert 2). Taking some exercise could help ADHD-diagnosed children reduce their stress levels. Rich *et al*., (2005) also investigated the impact of frustration on disrupted attention. The study has concluded that frustration has a strong link to attention and sustaining focus, which cause poor performance.

Engaging with difficult tasks/activities

The ability to listen and engage efficiently with a task is fundamental to learning. However, complex tasks or activities may not allow diagnosed children to keep focusing in order to complete a task. Too much technology involvement, tools or complicated tasks may make them tired, bored and distract them from staying focus. For instance, a task that requires high working memory, holding and retrieving information in order to following mathematic instructions would be problematic. Having said that, due to the differences types of ADHD, children may react differently to computer use.

Motivation

The experts identified motivation as a significant influence on knowledge construction. They have also noted that many ADHD-diagnosed children have motivational difficulties in terms of concentrating or keeping focused on any task. Therefore, experts and ADHD coaches pay frequent attention to motivation as a key to success. More importantly, ADHD children cannot try harder to improve motivation on their own. "*Choosing the right method with bits of motivation besides would be helpful for them overcome their attention and learning disabilities*" (Expert 6).

Taken collectively, these perceptions described by experts are conducive to the literature on ADHD impairments and an aetiological model associated with ADHD. For instance, poor attention skills have been identified as one of the core deficits at the cognitive level (L1). More importantly, other symptoms that cause attention deficit (*i.e.* distraction) have also been recognised by experts, as forming the aetiological model of ADHD. Therefore, this data analysis supports the constructs and dimensions generated from the literature review.

4.8.6 Social skills in ADHD

It is widely established that ADHD children have significant complications in terms of their social interactions. In fact, awkward and inappropriate communication with others results in social rejection for ADHD children. One of the experts claimed that, "*Approximately 60% of children with ADHD are rejected by their peers or others… They have difficulties adjusting to the social situation. Their aggressive behavior*

and their anxiety always make trouble for them. They can understand the situation, but this is out of control…" (Expert 3).

The rate explained by the experts may be slightly lower than that stated in the literature. According to Wehmeier *et al*., (2010); "*up to 70% of these children with ADHD may have no close friends by third grade, especially if they have comorbid ODD or DC. Adolescents with ADHD also usually demonstrate less sharing, cooperation, or turn-taking"* (p.210). Therefore, according to the experts, communicational disorders are allocated into two categories: *disruptive*/*aggressive* children and *shy* pupils. Significantly, aggressive children often are not aware of their actions due to their weaker sense of self-control. Since they do not have the ability of 'doing', they are unable to dependably use their skills in everyday communications. When discussing social skills in ADHD with participants, they emphasised largely the reasons and solutions that help them overcome this problem. For instance:

"*Yes, mostly have social skills deficits, and the reason is because of inattention, low concentrate, and low confident. They have the capacity of social communication if they are pure ADHD. However, social skills can improve by talking to friends about things they are interested in; Watching and listening to people. This might help them to interpret facial expressions, which is very useful in group conversations. We advise them to join to a local support group as a starting point*" (Expert 1).

This comment illustrates that co-morbidity would also influence poor social skills in ADHD. For instance, the possibility of poor communication skills for a child with dual diagnosis of ADHD and autism is greater than for a child who is pure ADHD.

Another reason for social difficulties stated by the experts is explained below, in line with the aetiological model of ADHD:

"… *Sometimes because, they are impatient, they are not able to wait for their turn and interrupt teachers or other students*…" (Expert 7).

"*Impulsiveness and hyperactivity may cause poor social skills. Difficulty in staying focused or paying attention would be other reasons. Unfortunately, low self-esteem, and low self-confidence make them isolated and they don't even try to joint to groups or their peers. They are just under pressure for their behaviour and sometimes this makes them embarrassed*" (Expert 3).

According to the experts, these findings support the aetiologocal model of ADHD. In other words, social impairments and communication problems are not far-removed from a diagnosis of ADHD. Therefore, helping these children to build close relationships with peers, other classmates, teachers and family is an essential goal on which to focus (Pearl and Donahue, 2004). When participants asked the effects of social skills at school, the responses were as follows:

"…*Children with social difficulties are at the risk of academic underachievement. Social skills are significant to success in daily life. Positive peer relationships can reduce their stress and give them a lot confidence*" (Expert 2).

"*It is a fact that a social difficulty is one of the most important issues of ADD/ADHD at school. Although they are interested in building relations with others, they mostly have problems with that. However, in some cases, we can see that they volunteer to answer questions or engage in tasks. Sometimes they interrupt the teacher to answer. This shows their interest in the subject*…" (Expert 4).

Consequently, two interpretations have emerged: (a) interest, and (b) poor social skills. Evidence from experts represents that although ADHD children are at risk of social impairments, they tend to be involved and interact with others in social settings. Likewise, they tend to express their interests under certain conditions (*i.e.* interesting stimuli). In contrast, they are often rejected by their peers. Behavioural impairments such as disruption, anger and/or hyperactivity of a child put them in serious trouble at school.

Similarly, when the researcher asked experts to suggest any solution to solve such social deficits, the following comments were made:

"*It would be good for them to get as much experience as possible practicing with other children, for instance playing with other kids, playing music, doing sports, etc. This may provide opportunity to find friends and develop their relations with others. Teacher as a second role could help them with this issue*" (Expert 7).

"*Some social activities, playing games in groups, or puzzles could help them start to build their communicational skills*" (Expert 6).

Overall, the two comments above expressed educational pedagogy that helps to overcome the social difficulties associated with ADHD. The comments also emphasised the different roles a teacher might adopt in the classroom (*i.e.* parent, coach, expert). For instance, a child with emotional problem (*i.e.* being shy) cannot try harder to communicate with other classmates. Therefore, the teacher's role might change to that of coach or parent in order to provide children with the required support to overcome such difficulties. Importantly, this has been linked with ***7Ms***, which is necessary to explore in the context of different educational needs.

4.8.7 Organisational skills in ADHD

The discussion with experts has raised several aspects of organising: organisation of mind or executive function, behaviour, time and scheduling, planning, organising in terms of completing tasks and/or handwriting. Findings illustrate that schoolchildren with good organisational skills are able to systematically keep track of lessons and manage the information or learning materials they receive. Moreover, experts revealed that, in order to be organised, attentional skills, effort and time management are required. In this respect, some comments from experts are highlighted below.

"*… They have extreme problems with time management, organisational skills, prioritising, and planning ahead*" (Expert 2).

"*…From losing things to missing appointments with doctor or friends…the nature of their brain is just disorganised; Moving from one thing to another*" (Expert 5).

"*Organisational ability is one of the executive functions. Planning, time management, and organising are in the sets of cognitive deficit…"* (Expert 7).

When organisational skills have been approved as one of the other chronic difficulties of ADHD through expert participation, some comments has been received with relation to the reasons for organisational deficits. Interestingly, the expert comments revealed the explanations behind organisational disorder, which is in line with the literature (Barkley, 2003).

"*Being disorganised is very common among ADHD, due to their present impairments, impulsivity and hyperactivity. They may struggle with sleeping, stress, or emotional problem. So, these issues might matter as organisational deficits"* (Expert 6).

"*…The reason behind might relate to their memory skills. There are some interventions to address these problems. They need a proper system for managing their time efficiently. Schedules, using day planner, charts, or diary, writing everything in the day planner and don't forget to check it*" (Expert 2).

To conclude, the analysis of the discussion with experts highlighted several issues that have emerged from the organisational impairments associated with ADHD. However, experts recommend some solutions to practice organisational skills in order to overcome certain learning difficulties. Using symbols or colour-coding papers, using pictures for necessary learning materials, prioritising their homework, tasks and activities, try to teach them to use folders and notebooks for their homework or assignments, or use calendars to help them organise their time management. Such strategies will be helpful to support the child to overcome his/her struggle with organisational skills. Moreover, the role of coach would be more effective in explaining the consequences of being organised; why we should organise, and help the child become organised. Therefore, this has been linked to ***7Ms*** (Mind set of perspectives).

4.8.8 Important issues of ADHD

Thus far, several ADHD challenges have been discussed with experts. Experts believe that *understanding* and *recognising* correct diagnosis is significant, since ADHD is a collection of symptoms; therefore, there is a high potential to select incorrect remedies. Moreover, ADHD is not an illness. "*Some saying that it is about*

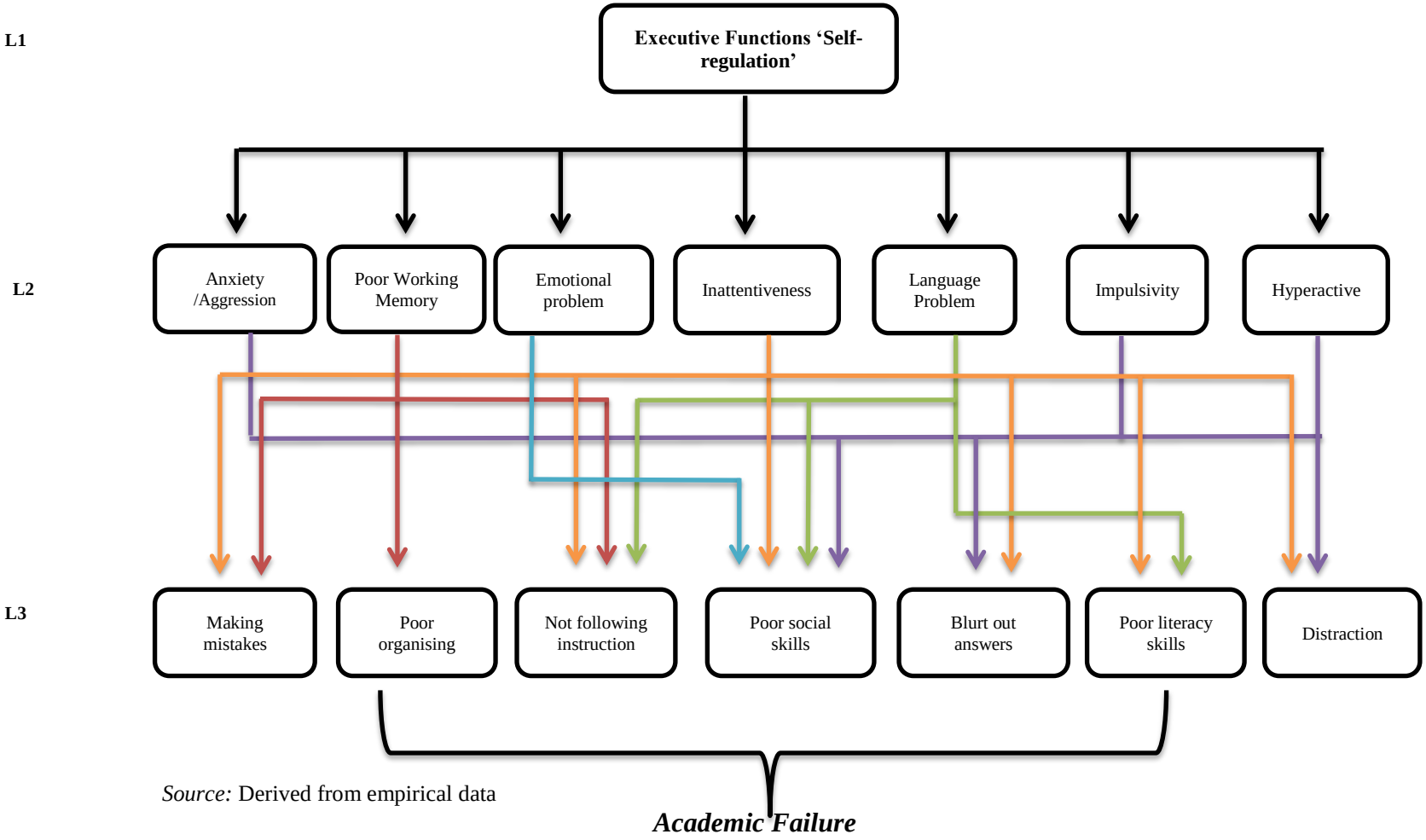
poor parenting, poor diet, and lack of consequences. Good diet calms children and adults, and reduce tension" (Expert 4). According to the literature, several studies believe that poor parenting and family functioning (*i.e.* divorced or separate parents) are associated with ADHD (Johnston *et al*., 2012).

From other viewpoints, important issues are *education* and *academic performance*. Effective teaching strategies plus different types of tools are required to support children's weaknesses. Moreover, successful educational pedagogy is required for schools in order to develop ADHD academic performance. In this respect, an expert believes that, "*Teachers' support and encouragement are needed in order to approach higher school performance*" (Expert 3). Unfortunately, children with ADHD are labelled as a '*lazy*' or '*unmotivated*'. Motivation can create positive consequences that impact directly on their school performance. Motivational skills can be achieved through interesting and appropriate principles or pedagogy criteria (***6Ms*** pedagogy schema) that strive to achieve for higher learning outcomes.

4.8.9 Aetiological Model of ADHD: Experts' View: *CLINICAL*

After investigating different aspects of ADHD through data analysis, the findings represent that experts' comments are in line with the ADHD literature relating to different impairments. In this respect, the model below has been devised and developed to explain how experts regard an aetiological model. Similar to the aetiological model generated from the literature, this model is also divided into three different levels of L1: brain functions; L2: intermediate factors; and L3: observable symptoms. Overall, this model confirms a set of impairments as necessary components of the aetiological model, which is in line with the literature. However, the literature model has been detailed into cognitive deficit level (L1), whereas the experts' model details its components in (L2). Moreover, behavioural impairments are placed in (L2) including: hyperactive, impulsivity, emotional problems and anxiety, which are similar to the literature. The model will be discussed in-depth later in this chapter.

Figure 4-8: Aetiologic Model of ADHD: Experts' view



Source: Derived from empirical data

4.8.10 New coding (I)

Thus far, data analysis has been based upon the pre-established coding arising from the ADHD model. Hereafter, the researcher employed grounded theory as an additional analysis approach through which to search for new codes and categories without the model's concentration. This section consists of an analysis of experts' talk based around new themes and codes that emerged from the interviews.

Table 4-18: New Coding (I)

Group	Key themes	Sub-themes	Code
1	**Co-Morbidity**	-Multiple disorder	CO: MUL
		-Dual diagnosis	CO: DUA
		-Suffer from dyslexia	CO: DYS
		-Reading and listening problem	CO: REA
		-Autism	CO: AUT
		-Overlap with DCD: Developmental Co-ordination Difficulties	CO: OVE
		-Dyscalculia	CO: DYS
2	**Executive Functions**	-Self-regulation	EXE: REG
		-Self-awareness	EXE: AWA
		-Monitoring	EXE: MON
		-Re-evaluation	EXE: EVA
		-Behavioural inhibition	EXE: BEH
		-Clinical view	EXE: CLI
		-Brain function	EXE: BRA
3	**Interventions**		
		-Fun learning (competitive)	INTE: FU
		-Toys	INTE: TOY
		-Physical motions	INTE: PHY
		-Memory cards/Dice	INTE: MEM
		-Figures, pictures, graphs, cartoons, video games	INTE: FIG
		-Concept mapping	
		-Visual learning methods: Colour-coded maps, colourful pencils	INTE: CONC INTE: VIS
		-Connecting dry facts to an interesting trivia	
		-Silly songs	INTE: CONN
		-Applications and tools: Power point, mixture of auditory modality	INTE: SON INTE: APP
		-Using computer-based cognitive training to help brain-training	
		-Movement in the studying	INTE: COM
		-Provide an active learning environment: active reading, writing	INTE: MOV
		Parental education	INTE: ACT
		-Repetition of instructions: Go through instructions	INTE: REPE

Source: Derived from empirical data

Co-Morbidity

Takeda *et al*. (2012) claim, "*ADHD, one of the most frequent psychiatric disorders in children and adolescents is well-known for its high-rate of comorbidities which occur in over 2/3 of cases*" (p.419). According to the interviews, more than 67% of those with ADHD are ADHD+, which clarifies a combination of disorders; however, the core problem should be present. Symptoms should reach the threshold; thus, each disorder should produce separate impairments. Surprisingly, the causes of co-morbidity remain unclear. The co-morbid link between ADHD and dyslexia describes that many things can be read incorrectly, although it is not because the person is not intelligent. *"A person with dyslexia is using the wrong side of the brain to read. As a typical person, when you are reading, you use the left side of your brain to keep the sequence of the letters; however, they use the right side of the brain"* (Expert 1).

Significantly, *'does ASD, DCD, Dyslexia, Anxiety, Depressive disorder, Dyscalculia, Developmental coordination disorder (DCD), and learning disorder occur more frequently in different ADHD subtypes?'*

Despite different diagnostic labels for different disorders, there is high potential of overlapping with mentioned types, whereby ADHD has been associated with different difficulties. However, different ideas were derived from discussions with experts. Depending on ADHD types, every individual has their own version. For instance, one of the experts suggests that dyslexia is likely occur in inattentive, rather than hyperactive, children. In contrast, other experts believe that hyperactivity and impulsiveness may increase the risk of co-morbidity. It is important to note that co-morbidity refers to the co-occurrence of two or more psychological disorders and is common in panic disorder; most typically other anxiety or mood disorders (Allen *et al*., 2012). Therefore, the literature investigation asserts that behavioural impairments may enhance the risk of co-morbidity.

Executive function

Executive function is defined by the experts as self-regulating. *"Executive functions refers to a set of cognitive processes 'neurocognitive abilities' including attentional skills, working memory, inhibition, self-monitoring, verbal reasoning, and problem*

solving" (Expert 6*).* The six aspects of executive function are interrelated to self-regulation as a central feature. According to the experts, executive function deficit is associated with ADHD due to the risk of many cognitive processes, as referenced above. In this respect, an expert defined ADHD "*not an attention disorder, it is just blindness to the future and future events*" (Expert 7). This means they are willing to pay attention, which does not reflect a disorder; however, ADHD children cannot distinguish between important and unimportant material on which to pay particular attention. Therefore, this may presents a performance failure in those with ADHD, rather than knowledge failure.

Interventions

Two intervention aspects have emerged from discussions with experts. One of the intervention aspects emphasises '*school-based strategies*' to support children's limitations. This could support schoolteachers who deal with ADHD students. Experts believe there are enormous applications and tools that will help a child with ADHD. Different learning modalities have been discussed in order to conclude what works better for ADHD. Rather than medication, computer-based cognitive training has been found to help train or develop part of the brain to function effectively. Teenagers who have limited working memory can take advantage of such a tool. Interestingly one expert stated that, "*Brain training games that specially concern visual and verbal processing or puzzle that concern attention and focus improvements work well for majority with ADHD. Thus, 20 minutes a week to use this training has been suggested for ADHD children to reach for effective results*" (Expert 4).

Moreover, fun learning would be the best form of educational strategy through which to enjoy math, reading and writing. For instance, memory and focusing games, picture puzzles or video games would be techniques for developing new skills. In this respect, one expert suggested; "*Teachers try to use physical motions in lessons, connecting dry facts to interesting trivia, or inventing silly songs. This could help children to remember things easier*" (Expert 1).

More importantly, experts believe that parents should be involved in helping their children to achieve impressive results in learning. Therefore, parental education

'*Parenting skills*' emerged from discussions with experts. Parental involvement has focused mainly on mothers, since they tend to spend more time at home with their children. Parenting ADHD can be a difficult job as they engage with both behavioural treatments as well as children's learning. This represents different the perspectives of parental roles that emphasise the ability to work with their child and support their learning. However, it is important to note, "***What works for today, might not work for the next day***" (Expert 1). Therefore, the style of parenting may affect the children's reaction. Overall, experts believe that ADHD coaches or psychiatrists could help both children and parents to manage their lives easier.

4.8.11 Conclusion

So far, this subchapter consists of an analysis of experts' talk about children diagnosed with ADHD and their impairments. The primary conclusion of this section was to verify the aetiological model of ADHD derived from the literature. In this respect, the points below highlight the conclusions that have emerged from this discussion:

- ✓ The aetiologic model of ADHD (experts' perspective) has been confirmed with the literature 'aetiological model of ADHD':
    - Three levels of cognitive deficit (L1), intermediate level (L2), and observable level (L3) have been confirmed and matched with the literature model.
    - Impairments and symptoms as individual components of the model have been identified at each level.
    - Relationships between different components have been identified.
- ✓ Different perspectives and roles of parents and teachers have been identified.
- ✓ Different types of ADHD impairments, different symptoms and the main issues of ADHD have been investigated.
- ✓ The reasons behind identifying symptoms have been discussed and different solutions have been explored to overcome the impairments.
- ✓ The link between ADHD and co-morbidity has emerged through discussion with experts.
- ✓ Different types of intervention have been determined based on: (a) school-based strategies and (b) parenting skills.

4.9 Section two: Coaches' view

The second group of interviewees represents ADHD coaches. Table 4-19 illustrates the key themes, sub-themes, codes and outcomes generated from Barkley and DSM-IV, followed by the coaches' perspectives based on their interview responses.

Table 4-19: Thematic and Coding Schema (II)

Group	Key themes	Sub-themes	Code	Outcomes
1	**Importance of ADHD**	-Executive functioning -How successfully manage ADHD -Hyper-focusing	IMP: EXE IMP: MAN IMP: HYP	**ADHD Model: Causal effects**
2	**Challenges of ADHD**	-Absentmindedness -Noisy behaviour/aggressive behaviour/doing physical dangerous activities -Impulsivity interrupt others -Poor memory -Lack of social understanding -Poor mental efforts -Not independent -Missing appointments -Learning difficulties -Not follow direction/rules -Poor information processing -Literacy skills/speech difficulty/not listening carefully/learning new words -Avoid engaging with tasks or activities/low participation -Procrastination/delay	CH: ABS CH: NOI CH: IMP CH: MEM CH: SOC CH: MEN CH: IND CH: MIS CH: LEA CH: FOL CH: INF CH: ILT CH: PAR CH: PRO	***DEVELOPMENTAL***
3	**Impacts of inattentiveness**	-Organising and planning -Distraction -Follow instruction -Reading/listening/participating -Social skills: reject by peers, and -Information processing	IMP: ORG IMP: DIS IMP: FOL IMP: REA IMP: SOC IMP: INF	
4	**Impacts of poor working memory**	-Organisational skills -Time management -Planning -Following instruction/rules/direction -Learning literacy skills -Information processing -Retrieve prior knowledge	IMP: ORG IMP: TIM IMP: PLA IMP: FOL IMP: LIT IMP: INF IMP: RET	
5	**Behavioral impairments**	-Hyperactivity -Restlessness -Distraction -Making noises -Not patient	BEH: HYP BEH: RES BEH: DIS BEH: NOI BEH: PAT	
6	**Strengths of ADHD**	-Creativity -Innovative and imaginative -Hyper-focus -Switch between tasks or activities -Can think outside the box/big picture/investigate different aspects of a situation -Intelligent -Accepting and forgiving	STR: CRE STR: INN STR: HYP/F STR: SWI STR: OUT STR: INT STR: ACC	

Source: Derived from empirical data

4.9.1 The importance of ADHD

As explained previously, what important about ADHD is the executive function deficit associated with disorders of the brain. According to coaches, ADHD is not simply having the three symptoms of inattentiveness, hyperactivity and impulsivity; there is a history behind all symptoms. Significantly, any child with ADHD is unique and has different levels of symptoms, strengths, advantages and interests. From the coaches' perspective, the importance of ADHD is divided into two aspects. The first aspect refers to, *how to manage successfully ADHD,* at home, school or at work. The second refers to different definitions, behaviours and different interpretations between girls and boys. In other words, it is vital to indicate that ADHD definitions or behaviours towards different stimuli are not similar between girls and boys. ADHD in boys is three times greater since hyperactivity levels are more prevalent than for girls. Therefore, logically, it would not be possible to allocate a series of challenges and learning difficulties to one child with ADHD. In this respect, different interventions are required in order to deal with the challenges associated with girls and boys. Overall, the findings in this section are supported by the literature review (*e.g*. Wodka *et al*., 2008).

4.9.2 Main challenges of ADHD

According to the coaches, one of the central challenges of ADHD is language disorder. A child with ADHD often has speech difficulty, which may contribute to the learning disorder. The coaches have identified different types of language problems: ***Syntax disorder*** (refers to the sentence structure); ***semantic disorder*** (refers to the writing, spelling, or speaking); and ***pragmatics*** (refers to the use of words towards communication or social use). This explanation is supported by the literature review (*e.g.* Hale *et al*., 2005). Therefore, "*Combination of expressed disorders in language impairments could have direct impacts on literacy skills as well as social skills (i.e. relationships, finding friends, and reject by the peers)*" (Coach 2).

Coaches believe that besides social life failure, a combination of challenges or symptoms might elevate the risk of academic failure, such as poor memory, poor mental efforts, poor information processing, procrastination or interrupting, all of

which express the causal effects of impairments. However, these failures do not necessarily conflict with intelligence. Interestingly, one of the coach's commented that; "*Sometimes dopamine is not flowing to give a signal to a child. Therefore, this signal failure causes inattentiveness that is called absentmindedness"* (Coach 3). As explained by the experts, such children tend to be more negative. Thus, it is difficult for them to work independently. In order for this to be achieved, someone is required to push the child forward and encourage them to make more effort. Achieving motivation demands a lot of effort from children with ADHD; however, depending on the individual, the child's ability would change. Therefore, teachers are more responsible for helping boost a child's motivational skills.

4.9.3 The impacts of inattentiveness

From the coaches' point of view, inattentiveness or attention deficit is one of the major behavioural disorders that refer to ***absent minded-ness***. Analysis illustrates that inattentiveness could affect negatively several aspects of daily life, such as school, home or work. Evidence based on research in the literature and interviews with coaches demonstrates that inattentiveness has strong genetic ties. Comments have been received by the coaches in relation to the influences of inattentiveness:

"*Children avoid engaging in a task that requires mental effort or high levels of attention. For instance, a complicated maths task needs the child to be prepared, organised, and planned for every stage in order to follow the instructions. This shows conflict with attention deficit disorder…*" (Coach 3).

"*Inattentive type of ADHD shifting from one task to another one. That's the impression of distraction, so it makes child become easily distracted…*" (Coach 1).

"*Inattentiveness may also lead to poor verbal or visual information processing because, their mind is already distracted by other stimuli…*" (Coach1).

Since the main concern of the study is based on academic phase, the following list of problems has emerged from coaches on the impacts of inattentiveness.

Problems/Symptoms/signs

- Organising and planning
- Distraction
- Follow instructions
- Reading/listening/participating
- Social skills: rejection by peers
- Information processing

To conclude, although inattentiveness itself is a single symptom, there are important consequences associated with ADHD children.

4.9.4 The impacts of poor working memory

After investigation on working memory through interviews with coaches, evidence suggests that working memory is one of the significant cognitive skills, in line with literature. Although working memory has been recognised as only one part of executive function, it is associated with the risk of academic failure. This is because memory often engages with practicing and learning activities (*i.e.* following instruction, literacy skills, mathematics, information processing and retrieving prior knowledge etc.). One of the coaches expressed that, "*Learning activities require strong memory. Most children with ADHD show delays to engage with tasks set by the instructor, and we imagine this is because of memory disorder*" (Coach 3). Therefore, it is concluded that poor working memory may delay a child's performance. This could be even more noticeable in daily-life planning, time management and organising. For instance, one of the coaches asserted, "*While you are reading a text, you should first process the information in order to store the important or relevant materials. So later on you need to recall stored information. Poor memory skills do not allow ADHD children to process information properly…*" (Coach 2). Hence, memory skills have been realised as a complex activity for children with ADHD. In this respect, a number of practices are offered by coaches to support children to successfully remember; for example, sustain focus by ignoring distractions or interruptions, summarising or taking note.

4.9.5 Behavioural impairments

As explained in both the literature review chapter and discussions with experts, one of the most significant matters issues in ADHD is the risk of developing behavioural disorders. Moreover, behavioural problems may instigate other disorders, such as Oppositional Disorder (OD) or Conduct Disorder (CD). According to the coaches, impulsivity, hyperactivity, temper loss, depression, no discipline, anxiety (serious violation) and restlessness all fall under the umbrella of 'behavioural disorder', which also refers to co-morbidity. ADHD coaches believe that there is no clear reason for behavioural problems, although the brain's function plays a significant role. Further, one coach noted that:

"*When it comes to hyperactive symptoms, many issues arise; Fidgeting and restlessness; moving around; making loud noises when others are silent; distracting others; switching from one another; and not being patient. It is important to see whether there are any other difficulties that make the condition more complicated. However, there are combinations of treatments such as behaviour therapy or medication*". (Coach 3).

4.9.6 Strengths of being ADHD

So far, data analysis has highlighted the different symptoms and challenges of being ADHD. Moreover, this has been established as a developmental disorder that affects many school-aged children or adults. However, there are some advantages to ADHD. Pupils with ADHD tend to struggle less with their symptoms when they are engaged in enjoyable and interesting situations. Some of the most creative and innovative people diagnosed with ADHD are entertainers, inventors, physicists and composers. Therefore, why is ADHD not regarded as advantageous? Below are some of the coaches' responses to the strengths of being ADHD:

"*Compared to typical people, having ADHD might give different perspective to a child. It allows children to understand the main principles in life. In order to be successful in both social and academic life, you do not need to be perfect. Sometimes* ***hyper focusing*** *gives child a wonderful feeling which makes him able to think a big*

picture of everything. You could say the mind is so focused that you cannot stop and you do not want to stop. This is what we call 'hours of engagement'" (Coach 2).

"*Daydreaming is the other side of* ***imagination***. *Some children really amaze us with their new ideas. They are able to think outside the box*" (Coach 1).

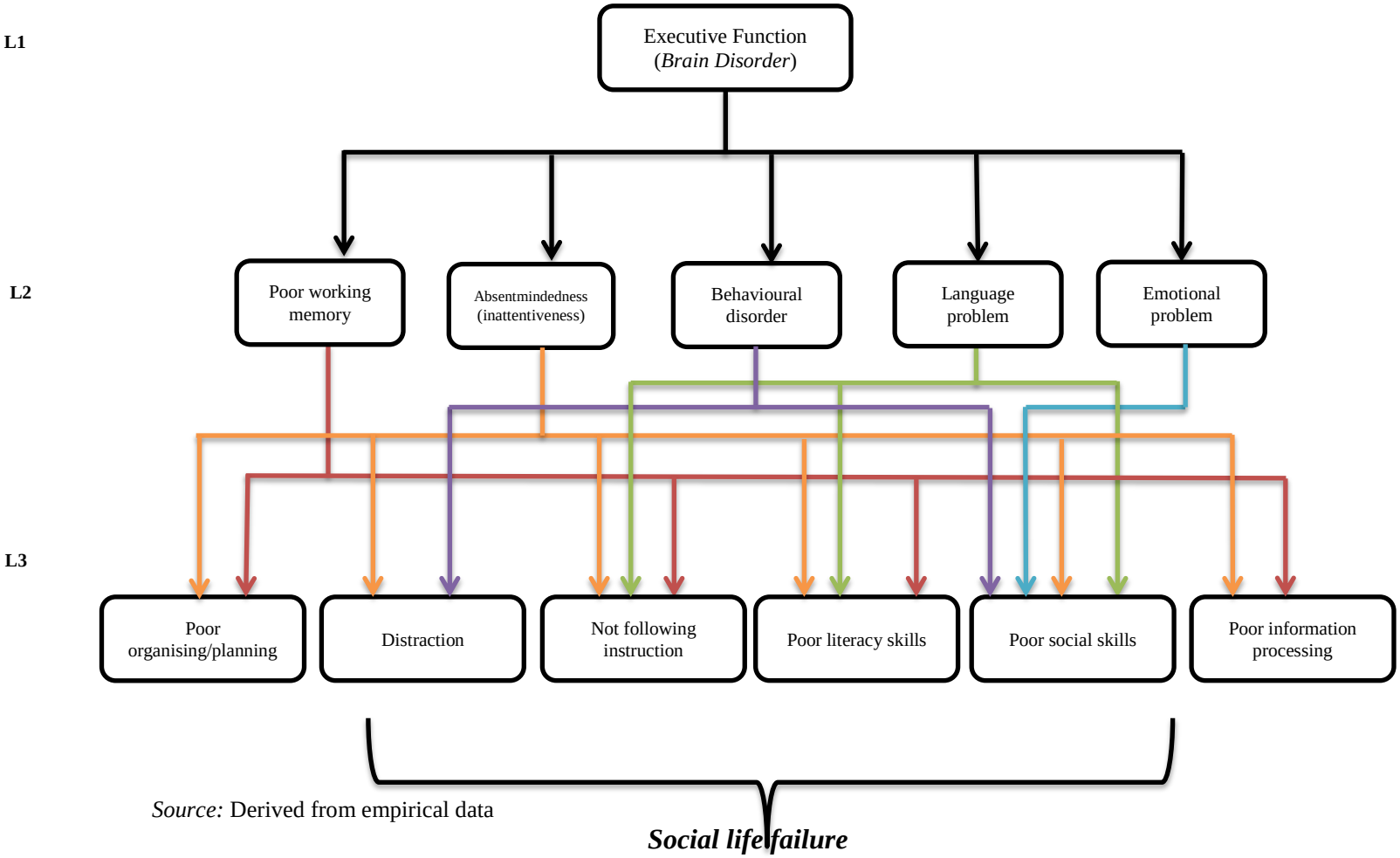
"*I don't see these kids as an abnormal. In any way they have a lot of gifts as a result of the way they process information and think. These people think differently and they are creative geniuses. They want to know everything; they want to know how everything relates. Yes it is distracting, but it would be a wonderful distraction…* " (Coach 1).

Overall, coaches were more positive about the various strengths of ADHD. Although such children have been found to achieve lower academic performance compared with typical learners, understanding the reasons behind different impairments may inform strategies with which to help children boost their strengths.

4.9.7 Aetiologic Model of ADHD: Coaches' View: *DEVELOPMENTAL*

The second ADHD model has been derived from discussion with coaches in terms of examining similar criteria elicited from the experts' interviews. This model, likewise, is divided into three different levels (L1: brain disorder; L2: intermediate factors; L3: observable symptoms). More importantly, the model has confirmed a set of impairments as the core components of the aetiological model, which is in line with the model presented in the literature. However, small differences can be seen in relationships, which will be clarified later in this chapter.

Figure 4-9: Aetiologic Model of ADHD: Coaches' view



Source: Derived from empirical data

4.9.8 New coding (II)

While grounded theory has been applied to cover new perceptions emerging from coaches, key themes, sub-themes and new codes are identified in Table 4-20.

Table 4-20: New Coding (II)

Group	Key themes	Sub-themes	Code
1	**Treatments**	-Medication	TRE: MED
		-Cognitive Behavioural Therapy	TRE: COG
		-Clinical Behavioural Therapy	TER: CLI
2	**Educational Interventions**	-Self-study	EDU: SEL
		-Magic/motion in everything	EDU: MAG
		-Different tools: flash cards, colours	EDU: TOO
		-Store information somewhere other than brain: summarising on the paper	EDU: STO
		-Teaching with rhymes	EDU: RHY
		-Electronic devices: recorder, spell checker, electronic calendar, quick link pen	EDU: ELEC
		-Visual and auditory modality	EDU: VIS
		-Collaborative (social) learning environment: Interactions between teachers and students; students and students (workshops)	EDU: COL
		-Flexibility in delivering information	EDU: FLE
		-Multimedia tools: using software *i.e.* Inspiration; Concept mapping	EDU: MUL
		-Active learning environment: discussion, project, research	EDU: ACT
		-Simplify instructions: handout files required, go through instruction step-by-step	EDU: SIM

Source: Derived from empirical data

Treatments

This section studies the significant role of ADHD coaching. As mentioned previously, coaches support ADHD disorders in developing an inclusive understanding of core symptoms as well as their impact on their daily life. Furthermore, ADHD coaches help parents of children with ADHD provide support and interventions in order to *'successfully manage ADHD*'. According to the coaches, three types of treatments have been explored: ***medication***, ***cognitive behavioural therapy*** and ***clinical behavioural therapy***. In fact, these treatments have been offered by coaches, and are often effective for reducing ADHD symptoms. When discussion turned to medication, it was identified that a large number are available. However, they stated, "*Medication does not turn children into zombies, but it may stop them from committing crimes. We cannot ignore side effects of medication. So far, insomnia is a common side effect of most of the medications*". (Coach 1).

For example, one of the main observable disadvantages of having ADHD is being disorganised (*i.e.* scheduling, prioritising, and life planning). Interestingly, the coaches claimed that they provide support through cognitive behavioural therapy to increase self-awareness, self-care, self-confidence and self-esteem. They also use different tools with which to guide them to better organise their everyday life. However, self-management achievement through such approach seems to be challenging, since they work directly with the patient. It is vital to consider that not all types of treatments are suitable for ADHD children. Depending on the variation of ADHD types (inattentiveness, hyperactivity, impulsiveness or co-morbidity), treatments may vary. Conversely, clinical behavioural therapists do not work directly with children, but they consult with their parents and teachers in order to manage their ADHD at home or at school.

Educational interventions

Findings from the analysis illustrate that both groups of experts and coaches had similar ideas about educational interventions. This demonstrates that it is significant to establish different types of strategies for school-aged children with ADHD. In fact, the question is how should teachers design educational environment to help children improve their academic and learning outcomes? Evidence from the interviews shows that treatments associated with educational interventions will narrow down academic impairments to improve learning. Several strategies emphasised by coaches support children for their academic achievements; for instance, self-study, applying different tools, using electronic devices, flexibility in delivering information (visual/verbal), simplifying instructions and teaching with rhymes, imagination, etc. Such interventions may make tasks more stimulating and provide children opportunities to make decisions from different choices based on their interests and qualifications. It is difficult for individuals with ADHD to become motivated for self-study. In relation to self-determined (self-study), one of the coaches commented that:

"*Self-study is important. They should organise themselves to do any task, be clear and mange themselves: What is my goal? What do I need to do now? How should I go through this problem? What information I need? What learning tools can be*

helpful in this case? How should I do to finish on time? The teacher should a model of how to do self-monitor, and students could practice it" (Coach 2).

Overall, this section explored suitable pedagogies applicable for ADHD children to provide support and help them to overcome their impairments. For instance, in order to develop self-study ability, children should get their symptoms under control, use their strengths and apply methods that are useful in order to study efficiently. This demands a lot of effort, positive attitudes, practice and patience. Consequently, the coach's role and coaching skills become more significant. Different coaching models providing a combination of powerful strategies and appropriate tools would support individuals diagnosed with ADHD and help them reach their potential by maximising their skills and abilities.

4.9.9 Conclusion

This subchapter consists of an analysis of coaches' discussion about children diagnosed with ADHD and their impairments. Similar to the analysis of experts, the primary conclusion of this section was to verify the aetiological model of ADHD derived from the literature. In this respect, the points below examine the conclusions reached in this section:

- ✓ The aetiologic model of ADHD (coaches' perspective) has been confirmed with the literature 'aetiological model of ADHD':
  - Three levels of Cognitive deficit (L1), Intermediate level (L2), and Observable level (L3) have been confirmed and matched with the literature model.
  - Impairments and symptoms as individual components of the model have been identified at each level.
  - Relationships between different components have been clarified.
- ✓ Coaches' role has been identified in order to provide support for children with ADHD.
- ✓ A set of challenges, behavioural and academic difficulties associated with ADHD has been identified.
- ✓ A set of advantages associated with ADHD has been explored.
- ✓ ADHD coaches have recommended three types of treatments, including medication, cognitive behavioural therapy and clinical behavioural therapy.

- ✓ Educational interventions were provided by the coaches in order to support children with their academic performance.

4.10 Section three: Teachers' view

Analysis of the third group is divided into key themes. Thus, this section consists of an analysis of the discussion with teachers about students diagnosed with ADHD and their impairments. Several key insights have been identified from the teacher analysis. Analysis of the interviews highlighted the main challenges and strengths of students, in addition to existing teaching strategies.

Table 4-21: Thematic and Coding Schema (III)

Groups	Key themes	Sub-themes	Code	Outcomes
1	**ADHD behaviour**	-Inattentiveness -Hyperactive/fidgeting/noisy behaviour/can't sit still/aggressive -Impatient / restlessness -Disruptive behaviour	ADHD: INA ADHD: HYP ADHD: IM ADHD: DIS	**ADHD Model: Causal effects** ***DIDACTIC***
2	**Observable learning difficulties**	-Poor focusing -Peer-to-peer working -Not following instruction -Poor literacy skills/reading/listening/writing -Poor motor planning -Distraction/interruption -Poor information processing -Memory problem -Math difficulty	OBS: FOC OBS: PEE OBS: FOL OBS: LIT OBS: MO OBS: DIS OBS: INF OBS: MEM OBS: MAT	
3	**Delivery method**	-Interaction/active engagement -Visual prompts	DEL: INT DEL: VIS	
4	**Visual or Verbal**	-Visual stimuli -Kinesthetic	VIS: VIS VIS: KIN	
5	**Technology**	-Computer -Quick link pen -Colourful pictures -Applications	TEC: COM TEC: QUI TEC: PIC TEC: APP	
6	**Introducing lessons**	-Handouts -Simplify -Flexible -Organising -Step-by-step -Summarising -Formulating activities	INT: HAN INT: SIM INT: FLE INT: ORG INT: STE INT: SUM INT: FOR	

Source: Derived from empirical data

4.10.1 Behaviour of a child with ADHD at school

It is estimated that many children with ADHD experience different types of associated challenges and characteristics. For instance, a number of symptoms have been recognised for inattentiveness (*e.g.* being distracted, lack of focus and poor

concentration, trouble sustaining focus). Likewise, schoolteachers have observed several symptoms of impulsiveness and hyperactivity. Discussion with school participants highlighted multiple disorders among ADHD children:

"*From school perspective, ADHD itself is a bit of mixed bag. We need to make sure, is it ADHD or is it about challenges, is it poor behaviour, or poor curriculum? Over the past 3 years, the number of students who have, or deemed to be AD/HD, has certainly increased*" (Assistant Head Inclusion).

"*A combination of difficulties can be seen in a child with ADHD. Depends on individual; I would say, learning difficulties, hyperactivity, sensory problem, motor skills, communication difficulties, etc., etc*." (Teacher).

Similarly, in the interview with the SEN Deputy (Assistant Head Inclusion), the researcher learned that in comparison with typical learners, students with ADHD display a number of challenges that make teaching more complicated for the teacher and teacher assistant. For instance, disruptive behaviour in a child with ADHD may distract other students from learning or concentrating on the learning materials. Conversely, making noises, fighting with classmates or exhibiting aggressive behaviour, rejection by their peers, and so on make these types of children more off-task than typical learners. Moreover, ADHD combined with autism, dyslexia and sensory disorder can make the job even more challenging for the teacher. Consequently, it is essential for a teacher to identify special types of diagnosis in order to individualise every case and support their needs. In this respect, the teacher's role switches to expert role in order to recognise the correct diagnosis of students. Identifying individual issues is significant in referring to a clinical level. Therefore, teachers recognise difficulties and develop specific and standard learning programmes in order to support children.

4.10.2 Observable Learning Difficulties

The analysis offered by the researcher arising from discussions with teachers also explained the most observable learning difficulties associated with ADHD in the classroom, which are in line with the literature. The emphasis in this section is on the

teacher's role, the achievement of tasks and achieving success at school. Teachers believe that although learning disabilities and ADHD fall within two different categories of disorder, there is a high possibility of both coexisting in one child. Moreover, teachers believe that despite having average level of intelligence, children with ADHD or ADHD+ are at risk of ***academic failure followed by long-term social life failure***.

Sensory processing and motor planning have been identified as a common difficulty for ADHD-diagnosed children. Sensory processing difficulties may influence negatively the efficiency of the child's ability. Hence, it could affect their emotional responses or self-esteem on one side and decrease communicational skills and destroy friendships on the other. Below are some responses about children's learning difficulties, which also express the teacher's role:

"*From my experience, majority of ADHD children have additional impairments in speech, information processing, memory problems and numerical abilities. Depending on the child, these levels could change. This does not ignore their strengths and their abilities. Children need visual prompts in every single task to support their understanding*" (Teacher).

"The *learning process includes three blocks: old information, new skills or information and gaining new concepts. To help children access their prior knowledge, teachers must plan for each task and provide a visual prompts, which reminds them of what they have learned in previous lesson*" (Teacher).

4.10.3 Delivery method

Numerous researches on learning have shown that interaction has a significant role that leads learners to understand the knowledge in-depth (*e.g.* Eagle, 2012). Interestingly, comments received from teachers were in line with the literature review since teachers' believe that interaction between teachers and students presents *active engagement* in the learning environment. Teachers spoke about specific delivery learning materials and highlighted the term '*interaction'* between children and teachers. Discussing this subject with participants has raised some comments, as follow:

"*It is very hard for children with ADHD to make them engage in a teacher-centred learning environment where teachers just lecture and there is no interaction between the children and teachers; for instance, when you are not using any visual prompts or learning tools…*" (Teacher).

"*Collaborative learning or social learning environments can be suitable for ADHD children. Having said that some children have difficulties with social skills, so it provides opportunity to learn how to talk, interact, and communicate with their classmates…*" (Teacher).

Conversely, with respect of delivery methods of learning materials participants commented:

"…They don't use to learn in the traditional classroom, they need something to motivate them. For instance, using technology, different applications, different tools, using programs, PowerPoint including pictures, animations, make task interesting, so that might work well…" (Teacher).

"*Multimedia tools are very useful, because you have a combination of delivery style in your method, which make them pay more attention and not bored at all. Using software like Inspiration, which is very user-friendly and motivational software, is similar to concept mapping that helps children and makes them be more organised*". (Teacher).

Overall, this section seeks to determine different types of information delivery method. This also explains the pedagogy appropriate for ADHD children, which is vital to establish educational interventions that support children in terms of their academic achievement.

4.10.4 Visual/Verbal learner

Discussing learning styles with teachers illustrates that the researcher cannot generalise a single and non-flexible teaching strategy for different ADHD subtypes. It is clear that every child with ADHD, and likewise a typical learner, has different

learning modalities. For instance, kinesthetic children perform better when moving around; therefore, hyperactivity among these children should have been anticipated in order to demonstrate higher performance. Similarly, a unique way of processing information has been expected, depending on each child. Hence, the researcher highlighted the following significant issues:

"*This is about different senses. Kids should feel learning materials. Some perform well in auditory system and other perform better in visual environment*" (Teacher).

"*They more tend to be visual; however, it depends on the personality and learning style of the children. Visual and auditory information can attract their attention more... Children with difficulty in auditory information processing can respond better to visual information…*" (Teacher).

Although many beliefs about learning styles have been discussed so far, teachers recognise three essential learning styles of visual, auditory and kinesthetic as the most commonly used in schools. Visual learners like to see more maps, pictures, graphs, diagrams or any visual prompts; in the other words, things that they can easily see. This would be an excellent motivational strategy with which to develop a child's motor planning and learning skills. However, other learners tend to be more auditory. This means that they prefer to hear things, such as rhymes or tones. Finally, the last group belongs to kinesthetic learners. This group often moves around while teacher is speaking. This does not always mean that they are not concentrating. Rather, they are able to focus more when they moving around or playing with a pen or pencil.

Understanding the correct learning style for every child with ADHD is essential for designing an appropriate teaching strategy. According to Chen and Sun (2012); "*Since each learner has a different cognitive learning style that is associated with multimedia material learning, presenting inappropriate multimedia learning materials to learners may negatively affect learning*" (p.1273). Therefore, learning could be quicker and more pleasant for children when learning materials present in an appropriate format (visual/verbal).

4.10.5 Cope with technology

Fabio and Antonietti (2012) claimed that hypermedia instruction produces better results of learning compared with traditional instruction. Interviews with special schoolteachers highlight the positive attitudes of ADHD children towards the usage of technology, which is in line with the literature. Teachers believe that the combination of different types of technology can be a good choice of teaching method to attract children's attention, since the attention aspect has been considered a core impairment of ADHD. When usage of technology has been approved as a beneficial teaching method by the school participants, some comments were received, as detailed below:

"*All of our students can cope with computers pretty well. Each class is equipped with computers. A computer is a tool for teachers in order to teach; we have a software programme for Math and English. All of our students engage in that task. So, using computers does not present an issue for ADHD children*" (Assistant Head Inclusion).

"*Using technology in teaching can be useful for such children, but we need to make sure they have ability to cope with… On the other hand, we have some kids that they have great potential to learn and work with computers*" (Teacher).

"…*Using colourful pictures and different types of animation can help them become motivated and pay attention*" (Teacher).

"…*It is amazing that some ADHD children can use software. Also, there is useful tool called Quick link pen, which allows them to scan any piece of writing, or summarise and transfer it electronically to the computer*" (Teacher).

The teacher analysis concludes that using technology to assist ADHD children in their learning achievements can have truly constructive impacts due to the underlying motivational aspects. Moreover, technology usage is a more interesting teaching pedagogy for such children in terms of supporting them to stay on task and developing their prior knowledge through repetition.

4.10.6 How to introduce lessons

As highlighted earlier in the literature review, providing lesson plans depends on the topic and types of learning materials changing. Teachers should take careful consideration when structuring academic lessons. Analysis of the teachers' discussion indicates that a special pedagogical model requires providing support to facilitate the learning environment. In this respect, six stages of effective teaching practices have emerged from interviews with teachers:

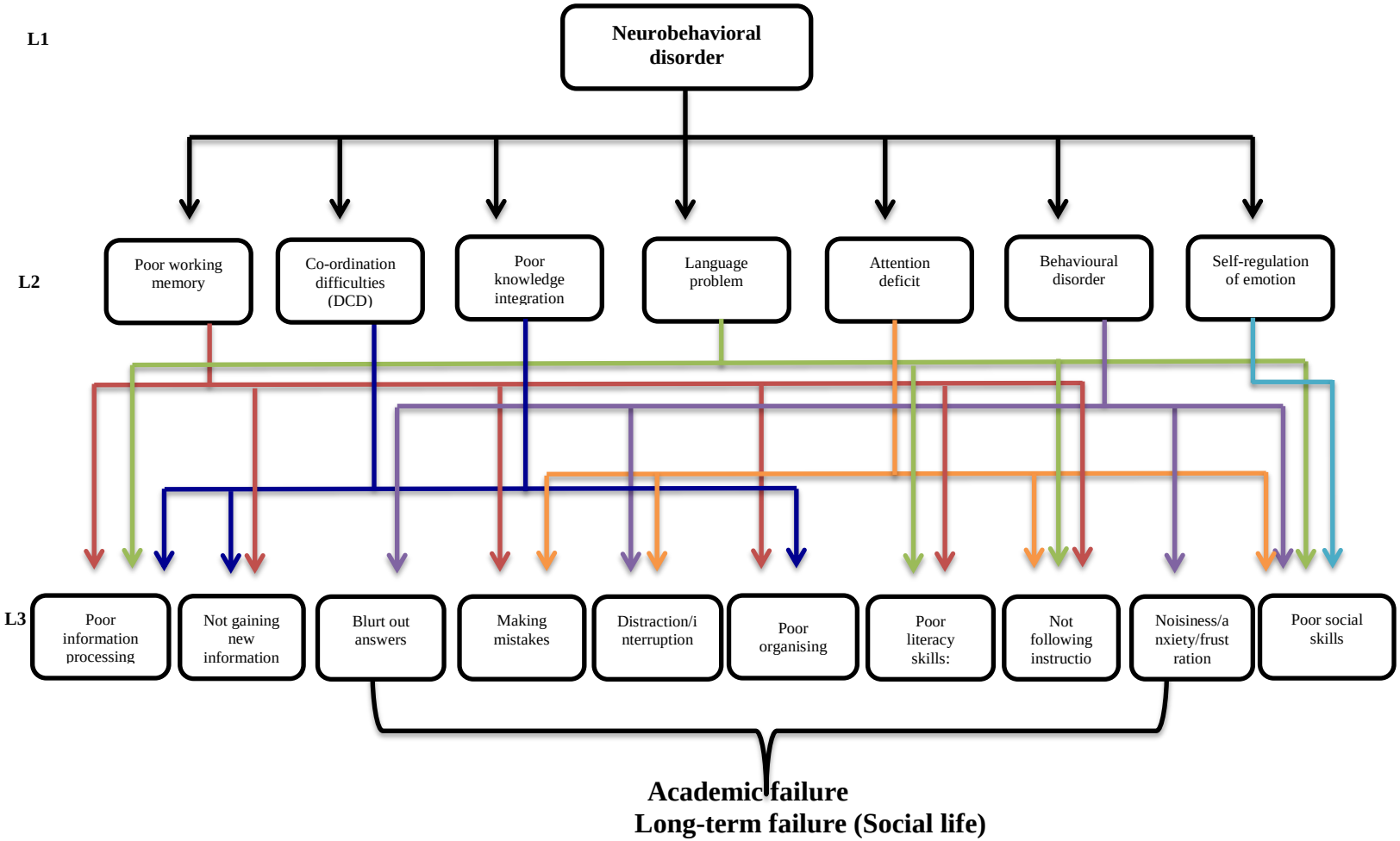
- Formulate planned activities/tasks
- Summarising prior lessons
- Identify learning expectations
- Explain behavioural expectations
- Identify required learning tools
- Simplify instructions and break complex tasks into several small tasks.

The six practices above have been identified as general strategies applicable to children with special needs. Under some circumstances, instructions should be individualised for different types of disorder; for instance, ADHD children often need additional assistance since they are unable to control their hyperactivity and impulsiveness. Similarly, their attention is not within their control. Therefore, the teacher should highlight the central words in the instructions to help children follow the directions.

4.10.7 Aetiologic Model of ADHD: Teachers' View: *DIDACTIC*

The third ADHD model derived from discussion with teachers is presented below. Compared with the other two models, this model clarifies more complete observable symptoms and the causal relationships between them. Similar to the two previous models, this model is divided into three different levels (L1: Cognitive deficit, L2: Intermediate factors, and L3: Observable symptoms). Since teachers play a significant role in both behavioural and educational aspects of children, they are able to observe more symptoms. Relationships between different impairments have been explored and will be discussed later in this chapter.

Figure 4-10: Aetiologic Model of ADHD: Teachers' view



Source: Derived from empirical data

4.10.8 New coding (III)

Table 4-22: New Coding (III)

Groups	Key themes	Sub-themes	Code
1	**Strengths of ADHD**	-Able to do	STR: ABL
		-Volunteer	STR: VOL
		-Multitasking	STR: MUL
		-Creative	STR: CRE
2	**Educational strategies**	-Planning	EDU: PLA
		-Different tools	EDU: TOO
		-Motivation	EDU: MOT
		-Evaluation	EDU: EVA
		-Time chart	EDU: TIM
		-Colourful	EDU: COL
		-Using flash cards	EDU: FLA

Source: Derived from empirical data

Strengths of ADHD

As discussed frequently in this chapter, the current section also presents an analysis of discussions that highlight the strengths of ADHD. Earlier discussion considered learning difficulties in schools; however, further analysis indicates that ADHD does not always represent poor cognitive skills. Interviews with teachers and the Assistant Head Inclusion indicate that ADHD symptoms also yield a number of positive characteristics. A number of ADHD strengths are explained below by respondents:

"*In my experience, we have several able students with loads of skills. As an example, being creative, hyper focus, doing perfect math even better than us…*" (Assistant Head Inclusion).

"*The bright side of ADHD, to the best of my knowledge, is that existing symptoms are not always presented as disadvantages. To explain why, let's take the example of impulsiveness. In fact, impulsivity is one of the core symptoms of being ADHD; having said that sometimes we could see this as a positive behaviour of a child. Imagine blurting out, when a child volunteers to answer any question, this shows his willingness to participate…*" (Teacher).

"*Another considerable ADHD advantages that have been identified by the teachers is multitasking. They can process simultaneously the multitasking of interests. In*

fact, they can switch their minds back and forth from one task to other. But, if for instance both tasks passionately interest them" (Teacher).

Interestingly, the findings derived from discussion with teachers are in line with the literature. However, not all school interviewees were agreed on the advantages of ADHD, unless under the cover of medical treatment. They claimed that medication has remained the primary treatment in ADHD in terms of supporting children with their limitations. The Assistant Head Inclusion also added that, without medication, children become out of control because every day is a challenging day for them. Therefore, in order to become more productive at school, children have to take medication, although it seems that this does not work well every time.

Recommended teaching strategies

Below is a list of existing teaching strategies pointed out by teachers with the aim of supporting children in their learning:

- Plan instruction for the class before the lesson (teachers have to be prepared)
- Provide learning opportunities that support children's social, intellectual and personal development
- Use a variety of instructional strategies in order to encourage children's development of engaging, thinking, understanding, problem solving and performance skills
- Provide individual and group motivation in order to encourage positive social interaction and active engagement
- Formative assessment: continuous (*i.e.* can you explain how you reached that, or what is the next step *etc*.)
- Use technology related to the lesson
- Remind children of the previous lesson (using fellable examples)
- Use a time chart to visualise (set for each activity)
- Use flash cards (contain pictures or diagrams with a written text)
- Provide three colour-codes: red: did not understand; yellow: have a question; and green: finished the task
- Give them a specific period time to complete the activity, which helps them focus on the task.

4.10.9 Conclusion

This subchapter has covered the analysis of discussions with teachers about children diagnosed with ADHD and their observable symptoms. Compared with the experts' and coaches' sections, this section provided significant content with which to support children with ADHD. This section has focused mainly on model verification, which was based on the aetiological model of ADHD derived from the literature. Other conclusions provided are as follows:

- ✓ The aetiologic model of ADHD (teachers' perspective) has been confirmed with the literature 'aetiological model of ADHD':
    - Three levels of Cognitive deficit (L1), Intermediate level (L2), and Observable level (L3) have been confirmed and matched with the literature model.
    - Different impairments and symptoms as individual components of the model have been identified at each level.
    - The links between different components have been clarified.
- ✓ The teacher's role has been identified in order to provide supportive educational pedagogies that help children with ADHD to achieve higher academic performance.
- ✓ Six stages of effective teaching practice have been developed as a suitable pedagogy.
- ✓ Different strengths advantages of being ADHD have been clarified.
- ✓ Pedagogies matching learning style have been discussed.
- ✓ Different teaching strategies are recommended by teachers.

4.11 Section four: Parents' view

The final group consists of an analysis of parental discussion about children diagnosed with ADHD and their impairments. Similar to the interviews with experts, coaches and teachers, parents also displayed several aspects, which are categorised as following:

Table 4-23: Thematic and Coding Schema (IV)

Group	Key themes	Sub-themes	Code	Outcomes
1	**ADHD definition**	-Developmental disorder	ADHD: DEV	**ADHD Model: Causal effects**
		-Environmental	ADHD: ENV	
		-Behavioural disorder	ADHD: BEH	
		-Common condition	ADHD: CON	***EMOTIONAL***
		-Disadvantages	ADHD: DIS	
2	**Advantages of being ADHD**	-Thinking big picture	AD: THI	
		-Creative	AD: CRE	
		-Honest	AD: HON	
		-Intelligent	AD: INT	
		-Processing quickly	AD: PROC	
		-Switch from one to another	AD: SWI	
		-Hyper focus	AD: HYP/F	
		-Imaginative	AD: IMA	
3	**Challenges of being ADHD**	-Focusing/sustain focus	CH: FOC	
		-Depression	CH: DEP	
		-Low self-esteem	CH: SEL	
		-Social skills	CH: SOC	
		-Follow rules/direction	CH: FOL	
		-Disruptive behaviour	CH: DIS	
		-Verbal difficulty	CH: VER	
		-Math difficulty	CH: MAT	
		-Not patient	CH: PAT	
		-Aggressive/anxious/shy	CH: AGG	
		-Low performance	CH: LOW	
		-Poor memory	CH: MEM	
		-Give up quickly	CH: GIV	
		-Time management/missing deadlines	CH: TIM	
4	**Visual or Verbal**	-Visual stimuli	VIS: VIS	
5	**Technology**	-Video game	TEC: VID	
		-Computer	TEC: COM	
		-Mobile	TEC: MOB	
		-iPad	TEC: IPA	
		-Facebook	TEC: FAC	
6	**Educational strategies**	-Motivation is the key to learning (motivation is a desire to an action)	EDU: MOT	
		-Find out children's skills (souls, and their passion humour *i.e.* art, music, dance, exercise, etc.)	EDU: SKI	
		-Setting up expectations (layout schedules and mentally prepare the child)	EDU: EXP	
		-Break down the task	EDU: BRE	
		-Recognise whether a child is a visual or verbal learner	EDU: REC	
		-Using different tools (*i.e.* flash cards; maps, diagrams)	EDU: TOO	
		-Discover children's brilliant ideas	EDU: DIS	
		-Request tasks of interests	EDU: REQ	

Source: Derived from empirical data

4.11.1 ADHD definition

This section explains what ADHD means to parents and their understanding of being ADHD. Parents' initial perspectives of ADHD were categorised according to: developmental disorder and behavioural disorder. Below are some negative and positive responses to the definition of ADHD that emerged from the discussion. The negative aspects are as follows:

"*ADHD is a common condition starting in early childhood. They experience numerous difficulties in everyday life. It is dreadful experience and for me is a nightmare*" (Parent 2).

"*ADHD is a developmental disorder. It is environmental. It just appears at a very young age. It stands for attention deficit hyperactivity disorder. It follows some signs and symptoms of inattention, hyperactivity, and impulsiveness. The primary issue with that is attention deficit can be one of the critical roots of all disorders*" (Parent 1).

In contrast, some of the responses assigned positive meaning to ADHD:

"*I truly wish they would change the wording in ADHD/ADD. It is not a disorder, but simply a disadvantage. A lot of ADHDs are highly intelligent people, even more so than typical people*" (Parent 3).

"*In fact, ADHD itself makes you less effective than others. We sometimes hear that ADHD is not a gift. However, we are disagree. ADHD is small set of hundreds of psychological abilities that people have*" (Parent 4).

To conclude, parents tend to be more emotional when talking about their children's symptoms, compared with experts, coaches and teachers. They also express a parental role (perspective) through which they interpret ADHD positively. Different interpretations have emerged through parental discussion, all of which have '*developmental disorder*' in common.

4.11.2 Advantages of being ADHD

Since parents are so sensitive to their children's condition, the researcher began the interview by asking about the advantages of being ADHD. Despite ADHD impairments and the challenges discussed in this research, some parents do not accept ADHD as a disorder and they truly wish to change the wording of the terminology. Moreover, parents emphasise the advantages of ADHD. This also explains the parents' role, which expresses emotional perspectives (Mind set of perspectives). When parents have been questioned about the strengths of their child as an ADHD, a number of benefits have been explored that were in line with literature review.

"*Being ADHD is not a disorder, it is just a small disadvantages. This can be seen in our daughter; she is full of advantages. She has always been known about thinking about the big picture of things. She is creative; she is very intelligent, honest, and kind. Also, her brain can process information very quickly*" (Parent 3).

"…*She is creative and seems to see the big picture. She can shift from one activity to another as well as she can do multitasks of interests*" (Parent 4).

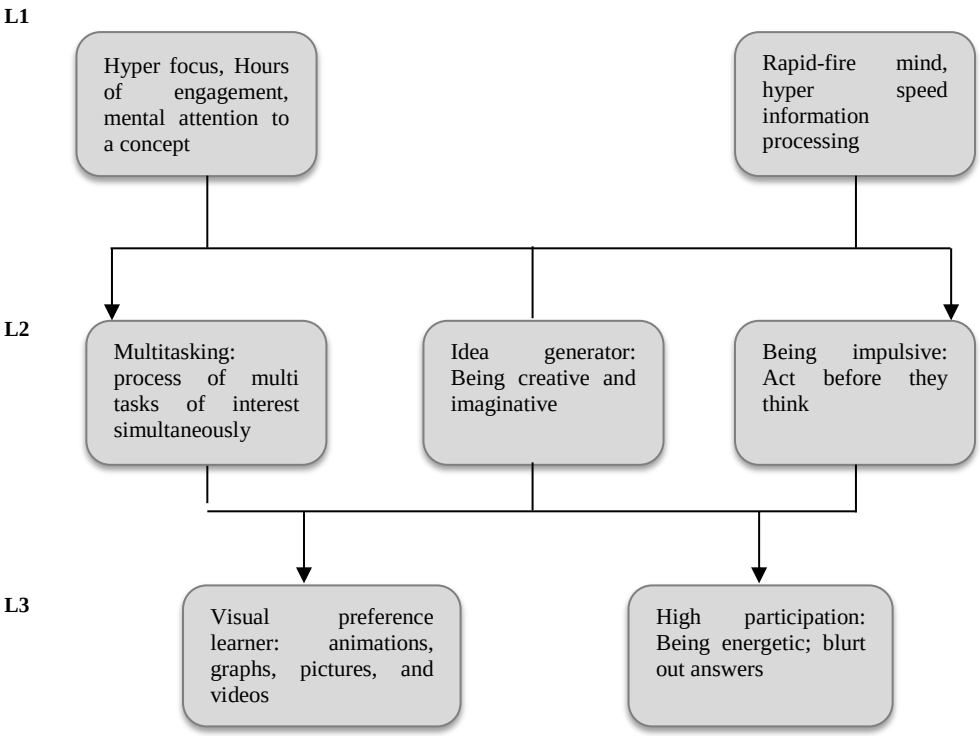
"*Sometimes give brilliant ideas, which for me and my husband seems a bit strange. At this stage of his life, we think teachers play a significant role in helping them to explore their strengths and try to improve them in a positive successful way*" (Parent 1).

"…*Being creative, fresh thinking, passionate, funny, hyper-focus, unique, and imaginative*" (Parent 2).

Collectively, these advantages should be considered in order to design an appropriate pedagogy schema with which to support ADHD children's limitations. The parents' role in their children's education is vital to consider. Experts frequently advise parents on good parenting. This is a difficult job and requires more understanding, involvement and patience. In this respect, parents should learn how to recognise a child's strengths in order to help them improve.

Figure 4-11 below clarifies the strengths of ADHD children at three different levels of 'cognitive strengths' (brain strengths), 'internal effects', and 'observable strengths', which emerged from parental discussions. Cognitive strengths such as hyper focus, hours of engagement, mental attention to a concept, rapid fire mind, and hyper speed information processing among ADHD children may lead child to engage in multitasking, being creative, and being impulsive. Overall, the findings from this section prove that although ADHD children and adolescents have chronic difficulties in school functioning, using appropriate educational principles or tools may encourage them to demonstrate their strengths in relation to their academic skills.

Figure 4-11: Positive aspects of ADHD



L1: *Cognitive strengths*

L2: *Internal Effects*

L3: *Observable strengths*

Source: Emerged from parental interviews

4.11.3 Main challenges of being ADHD

Within four groups of participants, the parents of ADHD children are the most critical group in that they often make decisions in relation to recognising symptoms in their child and applying different treatments. Qualitative analysis of parent perceptions of impairments provides valuable understanding of ADHD. In fact, parents believed that ADHD children are at a considerably higher risk of frequent difficulties compared with typical children, including behavioural problems, and emotional, academic and social life failure. However, identifying effective treatments was the main concern and of parents of ADHD children, as can be clearly seen from their comments. When the researcher asked them about the challenges, the following responses were received, in line with the literature (*e.g.* Barkley, 1997; 2003):

"*Dealing with my son to manage his ADHD is a tough job. Finding suitable treatments and educational strategies could support him with his condition. From one side, he is too emotional and on the other side, his aggressive behaviour makes me feel upset*" (Parent 1).

"*A more serious problem is focusing. We assume the word 'focus' stand for Follow One Course Until Success. My son is struggling with paying attention. He has been on different medications; however, we really don't know what suits him. I think attention is the main root of ADHD. Sub-disorders like following rules, missing deadlines, disruptive behaviour, being disorganised…*" (Parent 2).

"*She has memory problems; she forgets details. When she is reading a text, she cannot remember what she has just read. Then she becomes bored and fails to continue*" (Parent 4).

4.11.4 Visual or verbal learner?

As explained in the literature, Fabio (2012) pointed out, "*ADHD students need an empowerment to input processing thanks to visual presentation and increased motivation and this may be sufficient to improve learning outcome*" (p.2037). Discussing the learning style of ADHD diagnosed with participants has raised

several issues. Every child has his own learning type. In general, ADHD children use all five senses when learning, although they may find one sense more preferable than the others. It is vital to mention that parents believe visual prompts may be more satisfying for children as they can feel what is going on. In this respect, some parents made the following comments:

"*She tends to be visual than verbal. We should use motivating devices to help her interact with the outside environment* (Parent 5).

"*She can process both auditory and visual materials at the same time. Using PowerPoint in the class and recorded voice holds his interest till the end of the lesson*" (Parent 3).

Consequently, this section encourages teachers to use simultaneously visual and verbal teaching as it seems to have the potential to improve children's learning. It determines that adding a visual mode to the lecture (visual-verbal) in order to make the lesson more attractive for a student offers greater knowledge understanding. Moreover, it is important to note that parents play a significant role in their children's education. Therefore, parenting skills are required in order to help the child with their academic performance. Moreover, this is important inside the classroom, which refers to one of the teacher's role (emotional perspective).

4.11.5 Coping with technology

In the context of SEN, using technology and computer graphics applications is starting to produce near perfect outcomes in learning performance (Vera *et al*., 2007). However, we cannot generalise all types of special needs, since it depends on each type of ADHD and how the strength of the impairments, resulting in the design of a different technique. Discussing the usage of technology, such as computers, with parents represented their positive attitude. Below are some of their comments:

"*He is a big fan of screens, video game, TV shows, movies, and he wants to spend all day in front of the computer…generally, kids with ADHD like to be entertained, so how about using different types of technology*" (Parent 1).

"*Her reaction to the computer is very good. She recently has been using Facebook and Twitter. Although she is not sociable person, she isn't afraid to join to different social groups in Facebook…She is not shy in social network environment at all as long as she feels safe and is not face-to-face with anyone*" (Parent 3).

When they were asked for types of technology they are interested in, they responded surprisingly, as follows:

"*She is really keen of using technology, like new mobile or iPad applications, so she can design and create … surfe on the Internet, creating Gmail, Yahoo accounts and join Facebook…*" (Parent 2).

"*She can deal with computers but not professionally; simply painting, drawing pictures, and using computer games, or sometimes playing CDs*" (Parent 5).

4.11.6 Educational strategies recommended by parents

Parents believe that school creates multiple challenges for children with ADD. Parents think that suitable strategies would be helpful for children to meet their learning challenges and experience success. It is vital to find out children's skills, strengths and to understand how symptoms would affect their education and academic achievement. Below is a list of recommended teaching strategies proposed by parents.

- Setting up expectations (layout schedules and mentally prepare the child)
- Break down tasks into smaller tasks (avoid large assignments/tasks)
- Recognise whether a child is a visual, verbal or auditory learner
- Using different tools (*i.e.* flash cards; maps, diagrams)
- Discover children's brilliant ideas
- Request tasks of interest.

Although ADHD affects every area of work and school, it seems that appropriate strategies and treatments can recognise and boost their strengths.

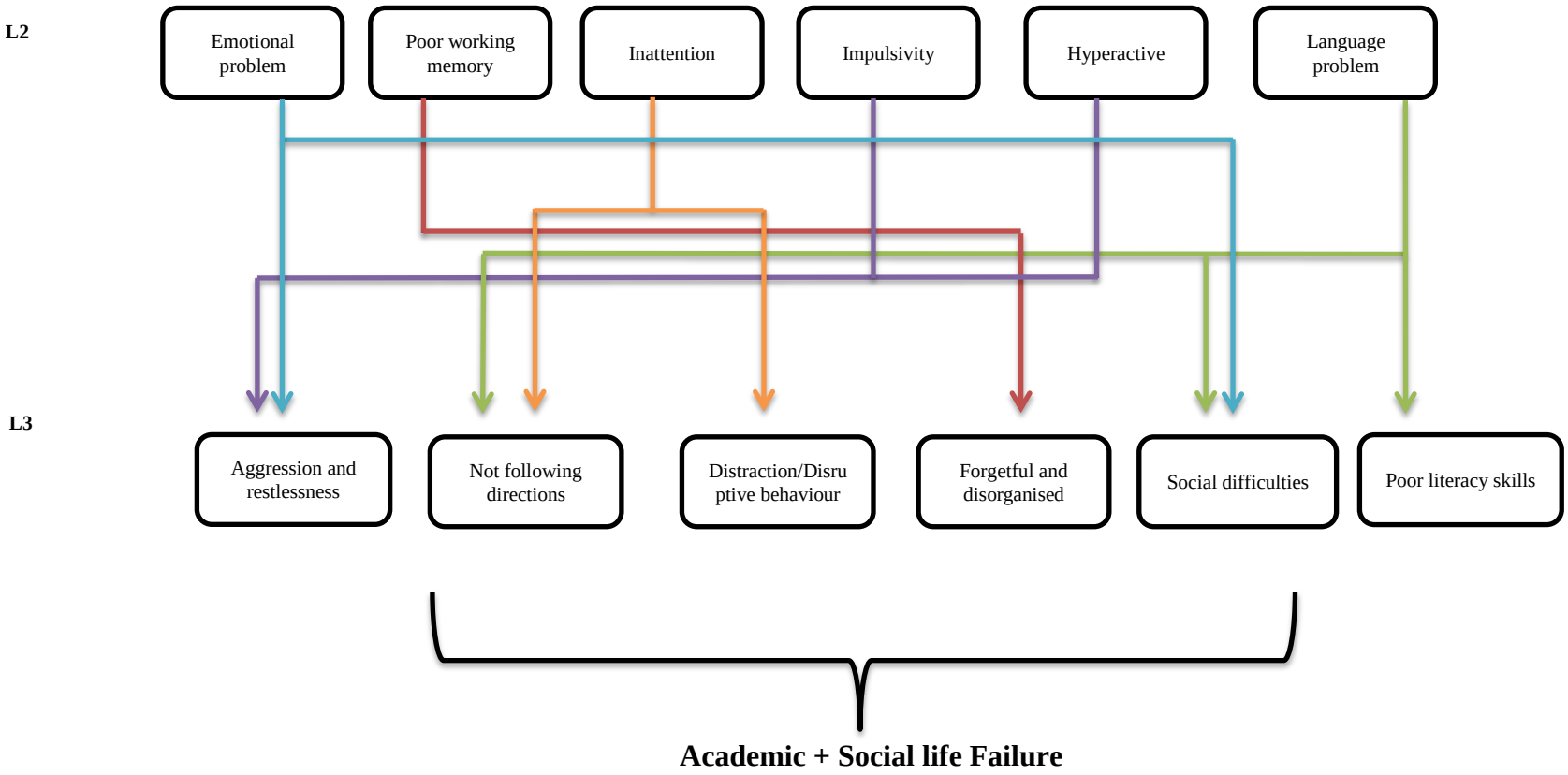
"*I think motivation is the key to learning. Motivation is a desire to take an action, when we find what is it that we want to do. Motivation is not easily recognisable, but it has direct impact on education. The biggest point is that we all look at children and they are struggling. Why they just don't do it, why not trying another strategies, what skills they have or don't have, how they should move towards a goal from point A to point B. They just don't know what to do next. Sometimes no one taught them how to start and how to process…*" (Parent 3).

"*We need to seek their soul and find out their passion, such as art, music, dance, exercise, etc., to celebrate their success. Teachers should use different tools and different methods. Punishment is not only solution, but also has negative impact…*" (Parent 4).

4.11.7 Aetiologic Model of ADHD: Parents' View: *EMOTIONAL*

Below is the final ADHD model that emerged from parental discussions. A slight difference can be observed between this model and the other three represented earlier (experts, coaches and teachers). Interestingly, the model derived from parental discussion is divided into two levels of L2 and L3, which indicate that one level (L1: cognitive deficit level) is missing. This illustrates the primary differences between the experts', coaches' and teachers' aetiologic models. However, the symptoms and challenges of ADHD have been similarly identified across the groups. The model will be discussed later in this chapter.

Figure 4-12: Aetiologic Model of ADHD: Parents' view



Source: Derived from empirical data

4.11.8 New coding (IV)

According to the grounded theory, new codes emerged as presented below:

Table 4-24: New Coding (IV)

Groups	Key themes	Sub-themes	Code
1	**Remedies**	-Psychiatric medication	REM: MED
		-Psychological therapy	REM: THE

Source: Derived from empirical data

Remedies

Parental interviews indicate that their general concern was based around *medication*. Generally, parents accept medication as the primary treatment; however, there are some parents that are reluctant to resort to medication. This is because of their belief that ADHD is not an illness. In fact, parents with ADHD children create an individual understanding of the syndrome. Hence, this could differentiate between those parents who agree with medication and those who do not. Overall, evidence shows that medication may not be the best, but it is an appropriate choice of treatment, since it provides more control over the condition. Below are some comments made in relation to using psychiatric medication:

"*Using medication has the ability to reduce behavioural problems like aggression, anger, or their hyperactivity in the short-term, but it is still not efficient since it produces side effects*" (Parent 2).

"*Teachers like their children to be on medication, but we feel that it makes my daughter even worse because of its side effects. After trying several medications, we think that she needs a speech therapist*" (Parent 3).

Overall, parental perspectives are different from teachers in terms of medication and remedies. This may be because of parental emotional perspectives or sensitivity, which makes them reluctant to put their children on medication, whereas the teacher's role (didactic) focuses more on reducing behavioural problems, such as distractibility or anxiety, while they teaching.

4.11.9. Conclusion

This subchapter consists of an analysis of parental discussion about their children who are diagnosed with ADHD, followed by their observable strengths and impairments. Similar to all three previous analyses, the main conclusion of this section referred to model verification of the 'aetiological model of ADHD', which is derived from the literature. In this respect, the conclusions listed below have emerged from this section:

- ✓ The aetiologic model of ADHD (parents' perspective) has been confirmed with the difference that one level (L1: cognitive level) is missing. In this respect:
  - Two levels of Intermediate level (L2) and Observable level (L3) have been confirmed and matched with the literature model.
  - Similar to the other three models, different impairments and symptoms as individual components of the model have been identified at each level.
  - The links between different components have been discussed.
- ✓ The significant role of parents has been discussed in order to achieve a higher level of academic performance.
- ✓ Different interpretations of ADHD have been clarified.
- ✓ Advantages and benefits of being ADHD have been explored.
- ✓ The use of technology to teach children with ADHD has been described.
- ✓ Educational pedagogies have been recommended by parents.
- ✓ The use of medication and side effects has been discussed.

4.12 Section five: The link between learning criteria and ADHD

Table 4-25 below illustrates the relationships between the learning criteria to succeed on one side, and academic difficulties and strengths experienced by ADHD children on the other side. Findings indicate that ADHD difficulties might lead to academic underachievement. The first row shown on the table below is labelled as a set of learning criteria. In contrast, the first column on the left is labelled as ADHD difficulties and strengths, which are specifically explained in Chapter 2. More precisely, the table is divided into two categories of stable characteristics (*referring to the element that substantively affects ADHD learners and does not change in its effects*), and unstable characteristics (*referring to the element that can momentarily affect ADHD learners but subsequently have no effect*). The distinction between stable and unstable characteristics is based on the extent to which an affective quality is present or a cognitive state persists. It can be clearly seen from the table that there are sets of stable and unstable characteristics; thereafter, the researcher evaluated whether the effects are consistently positive, negative, or changeable. In this respect, firstly stability and instability of individual characteristics have been assessed in order to confirm that the specific impairment or strength is always present. Secondly, whether the effects are also consistently positive, negative, or changeable has been examined.

It is significant to note that children with ADHD are potentially incapable of meeting the learning demands. However, it is misleading to consider simply the limitations and weaknesses of ADHD, because it frequently happens that these children demonstrate several advantages/strengths (*e.g.* Tymms and Merrell, 2011; White and Shah, 2006; 2011). The difference is that these ADHD impairments may be beneficial or detrimental to achieving specific learning goals. It can be seen from the table that, for instance, attention deficit as a stable and negative characteristic prevents learners from concentrating for extended periods of time. On the other hand, hyperfocus as a stable, and viewed as positive, characteristic of ADHD provides an opportunity to enhance the rate of learning outcomes. In this respect, the pedagogy could be designed to integrate the strengths of a child and capitalise on them. As a result, an appropriate pedagogical element that relies on learning must incorporate that can compensate for the consequences of every individual learning

difficulty. In this respect, 7M as mind perspective of the teacher/teacher assistant plays a critical role in helping children and providing support to develop their advantages/strengths towards learning goals.

Table 4-25: Link between Learning Criteria and ADHD

ADHD difficulties/ strengths	**Learning Criteria**						
	Active learning	Strong Memory	Knowledge Integration	Knowledge Reflection	Critical thinking	Motivation	Socialisation
Stable characteristics							
Attention deficit (N)	X		X	X	X	X	X
Poor short-term Memory (P/N)	X	X	X	X	X		X
Poor information processing (P/N)	X	X	X	X	X		
Difficulty following instruction (N)	X	X	X	X		X	X
Difficulty in reflection (N)	X	X	X	X	X		
Poor knowledge integration	X	X	X	X	X		
Poor language/ speech (N)	X		X				
Poor organising (N)	X	X	X	X	X		X
Poor social skills (N)	X						X
Hyper-focus (P/N)	✓	✓	✓	✓			
Unstable characteristics							
Rapid fire-mind (P/N)	✓	✓	✓	✓	✓		
Impulsivity (P/N)	✓						
Hyperactivity (P/N)	✓						
Motivation (P)	✓					✓	

✓ Represents Strengths of ADHD

X Represents ADHD weaknesses/impairments

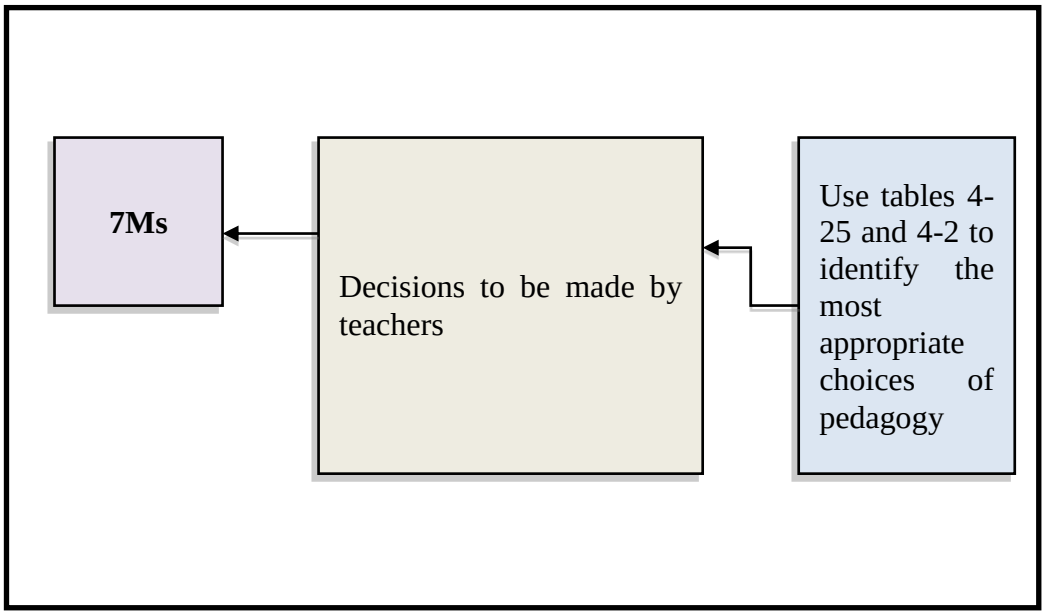
P Represents positive effects

N Represents negative effects

Source: Derived from the empirical data

Integrating table 4-25 above with table 4-2 presented earlier in this chapter provides a guideline for teachers in order to make a decision on the most appropriate choices of pedagogy. Figure 4-13 below illustrates how to make decisions on appropriate pedagogy choices for ADHD children.

Figure 4-13: Decision on Pedagogy choices



Source: Derived from the empirical data

Since this research is offering tentative guidelines for application of the pedagogy model, the researcher examined examples of pedagogy designed using different pedagogy criteria (7Ms) based on limitations and strengths of ADHD children. For the example, the researcher employed the schema above to ensure integration of tables 4-2 '*Tentative model of the link between learning criteria and pedagogy criteria*' into 4-25 '*Link between learning criteria and ADHD*' to facilitate appropriate pedagogy options. For instance, choosing a suitable educational pedagogy for a child with low levels of motivation, requires the teacher to search for options on pedagogy criteria from table 4-2 to determine which types of pedagogy do not require high levels of motivation. Evidence from empirical data illustrates that pedagogy designed for a particular child can be chosen through 'Mode of engagement: lecture, Method of facilitation: instructor-led, and Manner of feedback: formative feedback' which do not require high levels of motivation from the

students. Moreover, different roles of the teacher as a '7M' likewise need to aim to emotionally improve a child's motivation. On the other hand, multimedia learning (i.e. visual/textual: pictures, animations) selected from 'medium of delivery' dimension would also attract child's attention and may boost learning outcomes. Therefore, decisions that have been made on pedagogy dimensions not only does not require high levels of motivation during teaching episodes, but also it provides opportunity for a child to choose the delivery medium by his/her interests or abilities. In this respect, a possible pedagogy schema for a child with poor motivation can be designed as below:

Figure 4-14: Example of Lesson Structure For a Child with Poor Motivation

DIMENSION	SELECTION
Model of learning	Instructinism
Mode of Engagement	Lecturer
Method of Facilitation	Instructor -lead
Medium of Delivery	Multimeida
Manner of Feedback	Formative
Map of Content	Flexible
Mind Perspective	Emotional/Pedagogic

Source: Derived from empirical data

4.13 Section six: Comparison of perspectives

Thus far, this chapter has analysed semi-structured interviews with four groups of experts, teachers, parents and coaches from the UK and USA. Using the aetiological model as data for the qualitative content analysis and a grounded theory approach highlighted how the four groups displayed four different perspectives of the ADHD model. Importantly, this refers to the critical reality epistemology explained in the methodology chapter. Analysis from the four groups illustrates the groups' similar viewpoints on the challenges and strengths of ADHD; however, each group focused primarily on a particular level. Different perspectives, including **expert role:** Clinical/diagnostic perspective; **coach role:** Developmental/life and work management perspective; **teacher role:** Diagnostic/didactic/pedagogic perspective; and **parent role:** Wellbeing/emotional/daily life perspective, are vital in order to help children improve their learning performance. In this respect, based on each perspective, appropriate pedagogy is required to support children in the classroom. The four perspectives are examined below:

Experts' perspective:

Analysis of ADHD experts' discussion in this research determined their specific role. The investigation illustrates that a large portion of expert focus is based at the cognitive level for children with ADHD. Therefore, they emphasised the cognitive deficits that associated with ADHD and represented as L1 in the aetiological model of ADHD. This was known as the Clinical/Diagnostic perspective. More importantly, cognitive skills play a critical role in learning. Consequently, cognitive skills include attention skills, memory skills, speech and auditory processing, etc. and are the key factors considered by experts.

Coaches' perspective:

As explained in the methodology chapter, ADHD coaches help their patients achieve their goals and overcome their challenges; specifically, in their social lives. Therefore, analysis of coaches' discussion in this study represents their role as developmental/life and work management. In this respect, they have focused mainly on the different impairments displayed in L2 (*i.e.* behavioral disorder) and L3 (*i.e.* communication) and how to successfully manage ADHD.

Teachers' perspective:

Teachers play a significant role in recognising ADHD since they are often the first to be alerted to a child's behaviour or academic performance. This refers to the diagnostic level. Hence, the teacher often can distinguish between a typical learner and one with special needs due to the observable symptoms or abnormal behaviour that can be observed. Moreover, because ADHD diagnosis is all about observing a child's behaviour, emotions, education and cognitive skills, and social life (including L1, L2, L3), teachers play a critical role in supporting children to help them overcome their limitations. As a result, analysis of the teachers' discussion determined the diagnostic/pedagogic/didactic perspective of teachers.

Parents' perspective:

Analysis of parental discussion represents their emotional and wellbeing perspective. In fact, parents have not detailed different symptoms of ADHD, especially at the cognitive level. Their main concern was in choosing correct and appropriate medication or treatment for their children, thereby illustrating their sensitivity.

Collectively, all perspectives explained above are critically important in order to help children manage their ADHD. According to the aetiological model of ADHD presented earlier in the chapter, three different levels have been identified: cognitive level, internal effects and observable level. Hence, the aetiological model helps to support teachers at all levels. In this respect, pedagogy can be designed from the perspective of all roles emerging from this data analysis. Table 4-26 illustrates:

- ✓ The purpose/perspective of each role (expert, coach, teacher and parent)
- ✓ At which level each role has concentrated
- ✓ How many levels have been contributed by each individual role.

Table 4-26: Perspectives

Roles	Purpose/Perspective	Focus	Level
Expert	Clinical/Diagnostic	L1	L1 / L2 / L3
Coach	Developmental/Life and Work management	L2 / L3	L1 / L2 / L3
Teacher	Diagnostic/Didactic/Pedagogic	L3	L1 / L2 / L3
Parent	Wellbeing/Emotional/Daily life	L3	L2 / L3

Source: Developed from empirical data

4.13.1 Comparison of four ADHD models designed through interview analysis

Four aetiologic models of ADHD have emerged from the qualitative content analysis based on interviews conducted with four groups comprising experts, coaches, parents and teachers. It is significant to indicate that the four models generated are consistent with the aetiological model developed from the literature. However, the different groups viewed the aetiological model of ADHD from their own perspectives. In addition, colour-coding has been applied within the four models through arrows (executive function to L2: Black; behavioural disorder to L3: purple; language disorder to L3: green; attention deficit to L3: orange; working memory to L3: red; self-regulation of emotion to L3: blue; and poor knowledge integration and co-ordination difficulty to L3: navy blue).

In the very beginning, based around structure of models, it can be clearly seen that experts, coaches and teachers believe that three levels of impairments; however, parental views are slightly different, since they allocated impairments to two levels. Experts and coaches believe executive function to be placed at Level 1 (cognitive deficit level), whereas teachers believe that neurobehavioral disorder fits with Level 1. According to the literature, the terminology of neurobehavioral disorder and executive function refers to the combination of cognitive deficits, and behavioural and emotional disorders within the brain (Barkley, 2006a). Surprisingly, parents have not provided detail at a cognitive level, as they are more sensitive than the other groups to their children. This demonstrates their emotional perspective, which means

spending more time with their children and focusing primarily on observable challenges rather than the nature of the brain's functions.

Comparison of the four ADHD models illustrates that experts concentrated largely on Level 1 (executive function) and detailed ***self-regulation,*** which appears to be the central feature. The experts' viewpoint specified executive function in the following six aspects:

- Inhibition disability (to inhibit your automatic reaction, which comes from the brain)
- Self-awareness (ability to monitor yourself)
- Revise the past (guide yourself)
- Self-control (use language to think loudly but not publicly)
- Regulate your emotion (mature your emotion towards your goals)
- Problem solving (play with your mind).

Experts believe that ADHD is the most essential mental disability resulting in a disconnection between the *'doing*' brain and '*knowledge'* brain; hence, following the six aspects listed above as instruments or mind tools would direct children towards success in their daily lives. Besides L1, experts also discussed L2 and L3, and have identified different relationships between impairments.

Turning to the relationships between factors, the ADHD challenges in Level 2 and Level 3 between four models remained similar, although small differences have been perceived. One of the significant differences shown in the represented models has been identified as behavioural disorder. Experts and parents specified behavioural issues as anxiety/aggression, impulsivity and hyperactivity, which fit into Level 2; whereas, teachers and coaches had a broader viewpoint, presented in one category - behavioural disorder. In addition, teachers believe that a set of behavioural problems could result in noisiness, anxiety and frustration as observable signs.

Surprisingly, all four groups were agreed on poor working memory, language problems, inattentiveness, behavioural problems and emotional problems to be placed at Level 2. Significantly, coaches labelled attention-deficit (inattentiveness) as 'absent-mindedness'.

Another difference between the four represented models has been identified in the teachers' didactic model. Teachers believe in 'Poor knowledge integration' and 'Co-ordination difficulties', which fit into Level 2 as one of the other main ADHD challenges. In contrast, none of the experts, coaches or parents have emphasised these two crucial challenges. Likewise, reviewing the literature has justified the existence of poor knowledge integration and developmental coordination difficulties, which arises from the brain's dysfunction.

Turning to the next level, Level 3 as 'observable symptoms', investigation in all models illustrates the five common impairments of 'social skills', 'poor organising, time management or planning', 'distraction or disruptive behaviour', 'poor literacy skills', and 'not following instruction'. However, teachers highlighted the higher number of observable symptoms, which presents a more complex model. This is because teachers create multiple challenges for children with ADHD within the classroom environment. Therefore, the more tasks given by the instructor, the more challenges presented to the children. Developmental co-ordination difficulties and poor knowledge integration at level 2 and not gaining new information/skills at level 3 illustrate that teachers approach ADHD from different angles.

Interestingly, investigation of the four models illustrates that parents have a simpler model compared with coaches, teachers and experts. The reason for this can be attributed to the main concern of parents; ***choosing suitable medication***. Interviews with all parents participating in this study show that their main concern is in choosing the correct medication to help their child overcome his/her difficulties. Thus, the observable symptoms cited in level 3 presented in the parents' model are the main visible challenges to everyday life.

In terms of the causality effects of 'inattentiveness', all four groups believed in attention deficit among ADHD children, which prohibits students from following instructions/rules. Experts and teachers believe that inattentiveness among children may lead them to make mistakes and blurt out answers before the question/request has been finished. In addition, with the exception of parents, the groups were agreed on poor attention in ADHD, which may cause peer rejection or low levels of social skills. Hence, understanding the nature of attention is significant and basic.

All four groups mentioned the impacts of poor working memory. Investigation into the influences of poor working memory illustrates that teachers explained the highest numbers of observable symptoms. Teachers believe that low levels of memory could cause poor information processing, not gaining new information/skills, making mistakes, poor organising, poor literacy skills and not following instruction. However, parents simply think about the relationship between poor working memory and organisational skills (forgetfulness). Interestingly, the groups of experts and coaches had similar opinions on this particular causality.

Next, it can be clearly seen from the four models that all experts, teachers, coaches and parents had similar ideas about the symptoms caused by language problems. For instance, poor social skills may result from a language deficit, since it has a direct effect on building and maintaining relationships with other children. Experts think that parents play a vital role in developing children's social skills; hence, sometimes poor parenting may add a number of other difficulties for a child.

To conclude, according to the interviews with four different groups, the researcher recognised that all four models have similarities in several aspects; however, the level of awareness differs across the groups. Although experts have high levels of knowledge about ADHD, analysing their interviews illustrates that they focus mainly on cognitive functions and the brain's nature; whereas, teachers gave better advice from an educational viewpoint. Generally, coaches who have a psychological background help children to clarify what is problematic in their daily life and can provide enough support. Finally, parents were concerned mainly with the appropriate medication to make life easier. Table 4-27 details the components of the four models divided into three levels.

Table 4-27: Comparison of Aetiologic Models

Experts' perspective	Coaches' perspective	Parents' perspective	Teachers' perspective
		L1	
Executive functions / Self-regulation	**Executive functions**	**N/A**	**Neurobehavioral disorder**
		L2	
-Working memory -Inattentiveness -Language problem - { Anxiety Impulsivity Hyperactivity Behavioural disorder	-Working memory -Inattentiveness -Language problem -Behavioural disorder	-Working memory -Inattentiveness -Language problem - { Impulsivity Hyperactivity Behavioural disorder	-Working memory -Inattentiveness -Language problem -Behavioural disorder
-Emotional problem	- Emotional problem	- Emotional problem	-Emotional problem **-Poor Knowledge integration*** **-Co-ordination difficulties***
		L3	
-Poor organising -Poor social skills -Not following instruction -Poor literacy skills -Distraction	-Poor organising -Poor social skills -Not following instruction -Poor literacy skills -Distraction -Poor information processing **	-Poor organising -Poor social skills -Not following instruction -Poor literacy skills -Distraction	-Poor organising -Poor social skills -Not following instruction -Poor literacy skills -Distraction -Poor information processing**
-Making mistakes** -Blurt out answers**		- **Aggression/restlessness***	-Making mistakes** -Blurt out answers** **-Noisiness/anxiety / frustration*** **-Not gaining new information ***

- *** Item was unique to a particular role**
- **** Item was not shared by all roles, but a subset of roles**

Source: Derived from empirical data

As explained earlier, this section aimed to determine the four perspectives of experts, coaches, teachers and parents of ADHD and its symptoms (aetiologic model). Accordingly, three levels of L1, L2, and L3 have been considered in order to differentiate the impairments and challenges associated with ADHD. It can be clearly seen from the table above that three groups of experts, coaches and teachers agreed on L1 (executive function: as cognitive deficit), whereas parents did not address this level. A huge number of impairments placed in L2 were similar across all groups; however, teachers discussed more on observable signs (*i.e.* poor knowledge integration), which was in line with the aetiological model established by the researcher. Finally, an observable signs that identified in L3 illustrates that teachers were more detailed in individual symptoms; however, the core symptoms (inattentiveness, hyperactivity, and impulsivity) were discussed by all groups.

4.13.2 Conclusion

The main premise of this section was based on the different roles of experts, coaches, teachers and parents in order to explore their different perspectives. In this respect, the researcher established the conclusions listed below:

- Four perspectives match with individual group have been established including: Clinical/diagnostic perspective, Developmental/life and work management, Pedagogic/didactic perspective, and Wellbeing/daily life.
- The focuses of each role have been discussed in this section.
- Explained whether all groups of participants have discussed all three levels of cognitive, intermediate, and observable.
- Discussed and compared the relationships between impairments, to which each role contributed in order to explain the four aetiologic models.

The following chapter discusses the quantitative statistical analysis.

Chapter Five: Quantitative Analysis

5.1 Introduction

This section explains the first phase of data analysis followed by the research findings based on the quantitative study applied to the online survey. The objective of this stage is to verify the '**aetiological model of ADHD**' and its dimensions developed from the literature investigation. From the outset, it reports basic information about the dataset profile, normality and outliers. In respect of summarising the data findings, results are presented in a series of tables. Sixty-seven participants, including experts and parents, took part in the study, which is a small sample; therefore, the population of this section was sampled using purposive sampling methods (Tashakori and Teddie, 2003) (see methodology chapter, Section 3.14.1).

5.2 Dataset

The researcher received a total of 67 questionnaires through online survey from two different groups: ADHD professionals and parents from ADHD support groups in the UK and USA. As explained in the methodology chapter, the professional groups comprised a researcher/author in the field ADHD, a specialist in ADHD, a clinical psychologist or psychiatrist and ADHD coaches. The reason why these two groups were preferred was due to the insufficient number of participants. Consequently, of the 67 participants, 25 are parents and 42 have a professional role.

While entering the raw data into an SPSS (18.2) spreadsheet, screening for errors was the method used to identify the completeness and correctness of data, since mistakes could have been made easily during data entry. Since every dataset includes errors, hereafter, data cleaning plays significant role in achieving better results. The possible error that might have occurred to the analysis was in the outliers. Outliers might change Normal data into Non-Normal data since normality plays a significant role in a number of statistical analyses. Therefore, eliminating outliers might be a

solution to dealing with outliers, which may occur due to data entry mistakes. In fact, there is no standard procedure to follow for errors. Coakes and Steed (2007) claimed that errors in data entry are common. Hence, in relation to data cleaning in this analysis, the researcher checked data entry errors with out-of-range values. Frequency distribution gave the researcher the frequency of the occurrence of individual values belonging to a variable. Frequency analysis was obtained from SPSS until the results were displayed in an organised manner and no out-of range values in the dataset were identified. Overall, the dataset contained 52 usable questionnaires. The criteria used to select suitable questionnaires were based on the number of questions answered by participants. As such, those with more missing answers were removed from the SPSS spreadsheet.

5.3 Normality test

SPSS enables the user to test whether the underlying distribution of data is normal or not. Descriptive statistics, including means and standard deviations, have been applied at the first stage to the raw data to check the normality. Moreover, normality was tested by inspecting the Shapiro-Wilk statistic, as shown in the table below. The Sig value in Shapiro-Wilk must be greater than 0.05 to conclude that data are normally distributed.

Table 5-1: Shapiro-Wilk Statistic on ADHD Impairments and Status

Variable	Status	Shapiro-Wilk			Normality
		Statistic	df	Sig	
Attention					
	1.00	.886	30	.004	No
	2.00	.887	22	.011	No
Emotion					
	1.00	.955	30	.232	No
	2.00	.895	22	.023	No
Speech					
	1.00	.955	30	.226	No
	2.00	.876	22	.010	No
Memory					
	1.00	.003	29	.003	No
	2.00	.008	22	.008	No
Impulsivity					
	1.00	.867	30	.001	No
	2.00	.871	22	.008	No
Organizational skill					
	1.00	.877	29	.003	No
	2.00	.906	22	.040	No
Knowledge integration					
	1.00	.954	30	.213	Yes
	2.00	.925	22	.099	Yes

Source: Derived from empirical data

Table 5-2: Shapiro-Wilk Statistic results on Relationships between Factors and Status

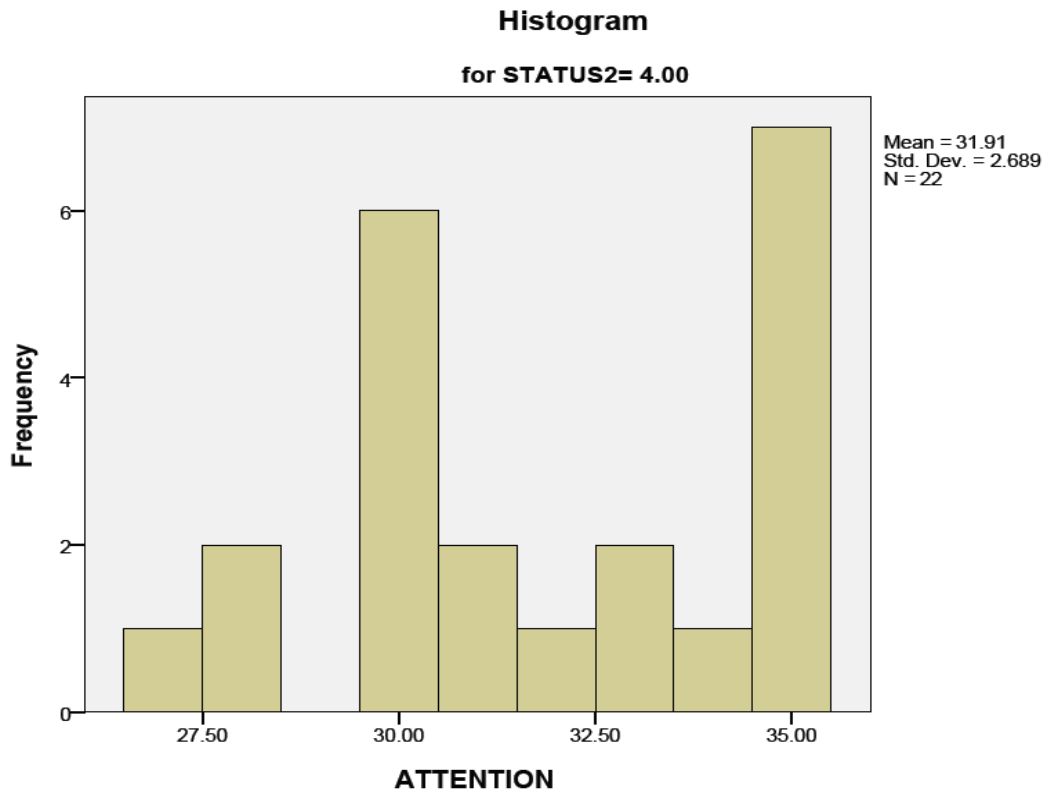
Variable	Status	Shapiro-Wilk			Normality
		Statistic	df	Sig	
Language problem causes					
	1.00	.940	28	.111	No
	2.00	.862	19	.011	No
Emotional problem causes					
	1.00	.852	29	.001	No
	2.00	.806	19	.001	No
Poor attentional causes					
	1.00	.840	29	.000	No
	2.00	.885	19	.026	No
Poor working memory causes					
	1.00	.894	29	.007	No
	2.00	.889	20	.026	No
Ability to process information					
	1.00	.891	26	.010	No
	2.00	.925	14	.260	Yes
Rapid-fire-mind					
	1.00	.936	26	.110	No
	2.00	.919	14	.209	Yes
Hours of engagement					
	1.00	.948	26	.208	Yes
	2.00	.799	14	.005	Yes

Source: Derived from empirical data

Tables (5-1, 5-2) indicate the value of Sig factors in the Shapiro-Wilk Test. The results illustrate that all **interval data** were not reasonably normally distributed since the Sig value in the Shapiro-Wilk column display (Sig value < 0.05) for approximately all interval data.

The histogram below presents a sample distribution of experts' responses on the attention variable. A full histogram for each individual variable is attached in Appendix E. As can be seen, Figure 5-1 does not represent a normal distribution.

Figure 5-1: Normal distribution



Source: Derived from empirical data

5.3.1 Conclusion

As explained in the methodology chapter (Section 3.10.2.1), the researcher intended to apply a Parametric Test in order to analyse data received from the questionnaires. However, since the data were not normally distributed, in order to test whether there are differences between the two independent variables of (Professional: 1 and Parent: 2) when the dependent variables are interval, the researcher decided to apply a Non-Parametric Test. Precisely, the Non-Parametric Test does not require normal distribution; moreover, this assumption is vital for small sample sizes. In this respect, Anderson and Algis (2001) claim that applying the Non-Parametric Test might be valid, despite the small sample size.

Hereafter, in checking the normality and choosing the Non-Parametric Test, the Mann-Whitney Test was applied to all data as an appropriate statistical procedure for

the researchers' data in order to identify any significant differences between the responses of two groups of professionals and parents of dependent variables, including attention; emotion; speech; memory; impulsivity; organisational skill; and knowledge integration. Consequently, the following section presents the results of the statistical tests.

5.4 Non-Parametric analysis

Table 5-3 illustrates the results of the Mann-Whitney Test applied to the data of the study. The test was applied to interval data based on two categorical groups of professionals and parents. The table below covers six items, including: status; the number of participants; mean rank; sum rank; and the Sig value.

Table 5-3: Results of the Mann-Whitney test on ADHD Impairments

Variable	Status	No. of Participants	Mean Rank	Sum Rank	Sig value
Attention					
1.00		30	25.77	773.00	.679
2.00		22	27.50	605.00	
	Total	52			
Emotion					
1.00		30	21.93	658.00	.010
2.00		22	32.73	720.00	
	Total	52			
Speech					
1.00		30	26.20	786.00	.867
2.00		22	26.91	592.00	
	Total	52			
Memory					
1.00		29	28.90	838.00	.105
2.00		22	22.18	488.00	
	Total	51			
Impulsivity					
1.00		30	23.35	700.50	.074
2.00		22	30.80	677.50	
	Total	52			
Organisational skill					
1.00		29	26.34	764.00	.846
2.00		22	25.55	562.00	
	Total	51			
Knowledge Integration					.019
1.00		30	22.30	669.00	
2.00		22	32.23	709.00	
	Total	52			

Source: Derived from empirical data

It can be seen from the table above that there are no significant differences between the two groups of independent variables in the responses of the most dependent variables, since the Sig value of the most were greater than (0.05). Hence, a very close Mean Rank has been established in some areas, which illustrates the similar level of agreement on the existence of ADHD impairments (*i.e.* attention, speech and organisational skills). However, the researcher has received different responses for

the two variables of '**emotion**' and '**knowledge integration**' by checking the Sig value (Sig value < 0.05).

5.4.1 Emotion

Statistics indicate that the Sig value of the variable 'emotion' represents (.010 < 0.05). Therefore, looking at the Mean rank value of both professionals (21.93) and parents (32.73) illustrates the significant difference between the two groups. This concludes that parents and professionals do not have the same level of agreement on the variable 'emotion'.

5.4.2 Knowledge integration

Similar to the variable 'emotion', results for the 'knowledge integration' variable highlight that there are significant differences in the level of agreement between two groups of professionals and parents, since the Sig value represents (0.019 < 0.05). Moreover, large differences are observed in the Mean Rank value of professionals (22.30) and parents (32.23). The higher mean rank represents stronger appreciation of the opinion. Consequently, parents agree more with the researcher's opinion than that of the professionals.

5.4.3 Speech

In contrast, the Sig value of the variable 'speech' display (0.867) is greater than (0.05). This indicates that there is no significant difference between the two groups of professionals and parents. Similar results have been received for the two variables of 'attention' (0.679 > 0.05) and 'organisational skills' (846 > 0.05), which illustrate that there is no significant relationship between the two groups.

5.4.4 Impulsivity

Investigation into the 'impulsivity' variable shows weak ideas between two groups of professionals and parents - Sig value (0.74). This indicates that, in some circumstances, people may accept the opinion. Investigation of the literature illustrates the level of agreement on the idea of impulsiveness (*i.e.* blurts out answers, difficulty awaiting their turn, interrupts conversations, and feels restless) (*e.g.* Barkley, 2003). However, statistical results show that more investigation is

required on the level of agreement to the idea of impulsivity between parents and professionals.

5.4.5 Memory

Turning to the 'memory' as a final variable, statistics represent a weak idea between parents and professionals, which require further evidence. However, reviewing the literature illustrates the existence of memory disorder in those with an ADHD diagnosis (*i.e.* verbal/non-verbal working memory, holding information, and recalling information) (*e.g.* French *et al*., 2003).

5.4.6 Conclusion

According to the results of the Mann-Whitney Test, in nearly all situations parents tended to agree more than professionals with the researchers' ideas. As such, there is a possibility that parents are inclined naturally to agree with formal statements irrespective of their actual beliefs.

The sensitivity and emotional perspectives of parents have been identified as one of the significant reasons for this. Since parents spend more time day-to-day with their children, it would be easier for them to realize the different challenges, compared with professionals. Whereas the professionals' key concern has been established as the executive function (cognitive level: ***L1***), which emphasises primarily brain function. Conversely, in the questionnaire, meanings of different factors have been clarified for the participants. Thus, the same definition and classification are given to both professionals and parents in order to answer a specific statement.

5.5 Verification of relationships between variables

Interval data

In the next step, according to the aetiological model of ADHD that has emerged from the literature investigation, the researcher had to verify the relationships between different variables on both impairments and strengths. In this respect, it was necessary from the outset to check the normality, which has been tested earlier in this chapter (Table 5-2). Data types produced in this section were interval. Therefore, since the data was **not normally distributed**, the Mann-Whitney Test was performed as an appropriate statistical test in which the interval data type aimed to:

- ✓ Identify whether the relationships between impairments that emerged from literature are represented correctly
- ✓ Explain the similarities or differences in the responses between the two groups of professionals and parents.

The test was applied to interval data based on two categorical groups of professionals and parents. The table below covers six items, including: status; the number of participants; mean rank; sum rank; and the Sig value. Full descriptive statistics are attached in the statistical appendix E. Table 5-4 below illustrates the output.

Table 5-4: Results of Mann-Whitney Test on Relationships between ADHD Impairments (Interval Data)

Variable	Status	No. of Participants	Mean Rank	Sum Rank	Sig value
Language problem causes	1.00	28	23.46	657.00	.739
	2.00	19	24.79	471.00	
	Total	47			
Emotional problem causes	1.00	29	20.52	595.00	.013
	2.00	19	30.58	581.00	
	Total	48			
Poor attentional causes					.136
	1.00	29	22.09	640.00	
	2.00	19	28.18	535.00	
	Total	48			
Poor working memory causes	1.00	29	24.31	705.00	.680
	2.00	20	26.00	520.00	
	Total	49			
Ability to process information					.154
	1.00	26	18.54	482.00	
	2.00	14	24.14	338.00	
	Total	40			
Rapid-fire-mind					.254
	1.00	26	18.94	492.50	
	2.00	14	23.39	327.50	
	Total	40			
Hours of engagement					.055
	1.00	26	17.88	465.00	
	2.00	14	25.6	355.00	
	Total	40			

Source: Derived from empirical data

5.5.1 Language problem causes

Results of the variable ‘language problem causes’ conclude that there is no statistically significant difference between two groups of professionals and parents. The Sig value here is (0.739), which is greater than the value (0.05). In fact, statistical results for the three other variables of ‘poor attentional causes’ (Sig value = 0.136), ‘poor working memory causes’ (Sig value = 0.680), and ‘ability to process information’ (Sig Value = 0.154) also represent similar results that there is no statistically significant difference between the two groups.

5.5.2 Emotional problem causes

In contrast, results based on the Sig value (0.013 < 0.05) highlight a statistically significant difference on the idea behind ‘emotional problem causes’ between two groups of professionals and parents. However, the researcher could not draw a conclusion simply on the Sig value. It can be further concluded that parents are more likely agree with the idea of ‘emotional problem causes’ compared with professionals, since the Mean Rank (professional: 20.52 parent: 30.58) proves higher value for parents.

5.5.3 Hours of engagement

Statistical investigation into the variable ‘hours of engagement’ as one of the ADHD strengths indicates that there is no significant difference between the ideas of professionals and parents, since the Sig value of the variable (0.055) has an equal value of (0.05). However, results demonstrate a weak idea between the two groups, which means that, in some circumstances, people may accept the opinion. Moreover, the Mean Rank for professionals (17.88) and parents (25.6) indicates a different impression for the variable. Therefore, more investigation is required on the strengths of ADHD to clarify the idea.

From Table 5-4, it can be concluded that there is a statistically significant difference in the idea behind the variable ‘*emotional problem causes*’ between two groups of professionals and parents. The findings present that parents have a higher appreciation of the statement compared with professionals. In contrast, results for the remaining variables indicate no significant difference between the two groups on

statements. Overall, further investigation is required on the level of agreement with ideas for each statement.

Turning to the following section, it is significant to identify any significant differences between the two groups of proffesionals and parents in the responses of dependent variables. However, this time is spent checking for the relationships when the dependent variables are ordinal and non-normal. Table 5-4 illustrates the output.

Ordinal data

As in the previous section, the Mann-Whitney Test was performed as an appropriate statistical test in which the ordinal data type aimed to:

- ✓ Identify whether the relationships between impairments emerging from the literature are presented correctly
- ✓ Explain the similarities or differences in the responses between two groups of professionals and parents

A total of 28 relationships have been investigated based on the impairments and strengths of ADHD children. The cases required measuring individually the position of each statement in the data set. The results are presented as below:

Table 5-5: Results of Mann-Whitney Test on the Relationships between ADHD Impairments (Ordinal Data)

Variable				Sig value
Status	No. of Participants	Mean Rank	Sum Rank	
Poor knowledge integration may lead to communication problem				.588
1.00	28	22.75	637.00	
2.00	18	24.67	444.00	
Total	46			
Combination of speech & auditory difficulties, poor attention, and poor working memory lead to poor knowledge integration				.821
1.00	28	24.34	681.50	
2.00	19	23.50	446.50	
Total	47			
Combination of auditory & speech difficulties, poor attention, and poor working memory lead to language problem				.612
1.00	28	23.21	650.00	
2.00	19	25.16	478.00	
Total	47			
Poor working memory causes slow information processing				.920
1.00	28	24.34	681.50	
2.00	20	24.73	494.50	
Total	48			
Slow information processing leads to attention deficit				.339
1.00	28	22.48	629.50	
2.00	19	26.24	498.50	
Total	47			
Language problem causes poor reading/writing				.837
1.00	28	24.32	681.00	
2.00	19	23.53	447.00	
Total	47			
Language problem causes difficulty in following instruction				
	28	24.59	688.50	.701
1.00	19	23.13	439.50	

	47			
2.00				
Total				
Combination of language problem and anxiety cause communication problems				.196
1.00	28	22.05	617.50	
2.00	19	26.87	510.50	
Total	47			
Poor organisational skills cause poor reading/writing				.124
1.00	28	22.10	641.00	
2.00	19	28.16	535.00	
Total	47			
Poor organisational skills cause difficulty in following instructions				.860
1.00	28	23.73	664.50	
2.00	19	24.39	463.50	
Total	47			
Poor attention leads to distraction				.146
1.00	29	22.45	651.00	
2.00	14	27.63	525.00	
Total	48			
Distraction leads to lack of focus and attention deficit				.257
1.00	26	21.35	555.00	
2.00	19	25.26	480.00	
Total	45			
Emotion problems lead to anxiety and impulsivity				.017
1.00	29	20.97	608.00	
2.00	19	29.89	568.00	
Total	48			
Anxiety may cause lack of focus and attention deficit				.139
1.00	28	21.32	597.00	
2.00	18	26.89	484.00	
Total	46			
Anxiety may cause restlessness and lack of focus				.055
1.00	28	21.05	589.50	
2.00	19	28.34	538.50	
Total				

	47			
Impulsivity may cause difficulty in waiting for task and restlessness				.063
1.00	27	21.02	567.50	
2.00	19	27.03	513.50	
Total	46			
Ability to generate original and unconventional ideas and to be creative				.987
1.00	26	20.52	533.50	
2.00	14	20.46	286.50	
Total	40			
Ability to interact with surroundings and to offer uninhibited responses (e.g. blurt out answers)				.154
1.00	16	13.56	217.00	
2.00	14	17.71	248.00	
Total	30			
Ability to hyper-focus and have full engagement on a task/activity they interested in				.275
1.00	26	19.23	500.00	
2.00	14	22.86	320.00	
Total	40			
Reasoning with visual and verbal information allows ADD learners to process multiple tasks simultaneously				.024
1.00	26	17.58	457.00	
2.00	14	25.93	363.00	
Total	40			
Integration of visual and verbal information can create unconventional thinking in ADD learners				.213
1.00	26	18.92	492.00	
2.00	14	23.43	328.00	
Total	40			
Separation of visual and verbal information can evoke productive-impulsive participation				.014
1.00	21	14.79	310.00	
2.00	14	22.82	319.00	

Total	35			
Ability to process multiple tasks simultaneously encourages greater levels of participation and interaction				
1.00	24	17.00	408.00	.109
2.00	13	22.69	295.00	
Total	37			
Ability to process multiple tasks simultaneously encourages greater levels of participation and interaction				
1.00	25	18.78	469.50	.333
2.00	14	22.18	310.50	
Total	39			
Ability to think unconventionally and creatively enables abstract processing of visual information				
1.00	24	17.21	413.00	.077
2.00	14	23.43	328.00	
Total	38			
Ability to think unconventionally and creatively encourages more productive and increased levels of participation and interaction				
1.00	25	16.86	421.00	.015
2.00	14	25.61	358.50	
Total	39			
A tendency to productive-impulsive participation enables faster processing of visual information				
1.00	25	17.14	428.00	.027
2.00	14	25.11	351.50	
Total	39			
A tendency to productive-impulsive participation encourages increased levels of participation and interaction				
1.00	24	17.13	411.00	.063
2.00	14	23.57	330.00	
Total	38			

Source: Derived from empirical data

It can be seen clearly in Table 5-5 that out of 28 variables, 5 have (Sig value < 0.05), which illustrates a significant difference of opinion between the two groups of professionals and parents. The findings are presented below:

5.5.4 Emotional problems

Statistical investigation into the ***emotion*** yielded different Mean Rank values in the two groups of professionals and parents (professionals: 20.97, and parents: 29.89), which displays a higher mean for the parent group. This means parents are more likely to agree with the idea of '*emotion problem leads to anxiety and impulsivity*'. As explained earlier, this might be because parents spend more time with their children on a daily basis. Apparently, behavioural disorders among their children are more observable for them than for professionals, who view ADHD behaviour from the outside. Moreover, parents' emotional perspectives have also affected their way of thinking about the statement.

5.5.5 Visual and Verbal Information Processing

In terms of the ADHD strength of '*processing visual and verbal information*', statistical analysis represents the Mean Rank of (professionals: 17.58 and parents: 25.93); confirming that parents are more likely agree with the idea. Therefore, the strength level of appreciation is higher for parents than for professionals. Similarly, this could refer to the emotional role of parents in that they tend to be more positive and observe more positives than negatives in their children. Whereas professionals think more realistically, so they do not emotionally view the impairments and strengths of a child.

5.5.6 Effects of Visual and Verbal information on ADHD Participation

Turning to the next variable '*Separation of visual and verbal information can evoke productive-impulsive participation*', since the Sig value displays less than 0.05, it indicates significant differences between the two groups; hence, comparing the Mean Rank of professionals and parent (14.79 and 22.82) statistical analysis indicates that parents are more likely to agree with the idea as statistics show a higher Mean Rank value of the parents. Similar to the prior variable explained above, this statement also discusses the strengths of children with ADHD. As clarified in the aetiological

model of ADHD presented earlier in the research, the symptom of 'impulsivity' as impairment can become an advantage (*e.g.* Tymms and Merrel, 2011). Consequently, parents tend to be more positive than professionals in terms of ignoring the disadvantages.

5.5.7 Creativity and levels of participation

The next factor is the '*Ability to think unconventionally and creatively encourages more productive and increased levels of participation and interaction*'. The Sig value is less than 0.05, which indicates significant differences between the two groups in the responses to the statement. Hence, by looking at the Mean Rank of professionals and parents (16.86 and 25.61), the statistics show that parents are more likely to agree with the statements. This means higher levels of appreciation to the positive statement.

5.5.8 Productive-impulsive Participation

Finally, there is a statistical analysis of the causality effects on the statement, '*A tendency to productive-impulsive participation enables faster processing of visual information*' between professionals and parent. Since the Sig value is less than 0.05; hence, the Mean Rank of experts and parents (17.14 and 25.11) indicates that parents are more likely to agree with the statement. This is because parents tend to be more positive than professionals about the capabilities and skills of their children.

Turning to the next step, although the Sig value of the remaining 13 variables (statements) presented in Table 5-5 revealed (Sig value > 0.05) evidence on statistics signifies different Mean Ranks among professionals and parents. This proves the existence of relationships mentioned in the statements on which both groups were agreed. To conclude, according to the results presented above, parents have generally ***positive*** experiences with the statements compared with professionals. Findings based on the statistical analysis illustrate different perspectives between professionals (**clinical**) and parents (**emotional**). In other words, the professionals' viewpoint of some individual impairments or strengths may arise from different angles to those of parents. Further results have been discussed in the qualitative section of this thesis, which clarified in detail the different perspectives (Chapter 4).

5.6 Correlation

The Correlation Test is identified as one of the most common statistical analysis to explore the possible existence of any linear association between quantitative variables. In other words, correlation analyses seek to determine whether there is a relationship between two different variables. If it does exist, how important or how strong is the relationship? In the quantitative section of this research, Spearman's Rank-Based Correlation Test has been applied since all data were not normally distributed. Therefore, Spearman measures a Non-Parametric Correlation Test, which does not require data to be normally distributed. Therefore, results are measured by value, as below:

0.2 < R < 0.4	Weak
0.4 < R < 0.6	Moderate
0.6 < R	Strong

According to Table 5-6 below, the value of the Correlation Test has been produced from two important values, including 'R' value and 'P' value. 'R' value represents the strengths while 'P' value represents the significant relationship between variables. It is important to note that correlation is significant at the (0.01) level. As a result, the lower 'P' value and the higher 'R' value indicate better results in correlation.

It can be seen in Table 5-6 that there is a noticeable correlation between the two variables of 'attention' and 'organisational', since the values are (R=.566 P=.000 N=51). In contrast, a weak correlation is found between the two variables of 'integration' and 'emotion' at the value of (R= .369 P=.007 N= 52). Moreover, there is a weak correlation between the two variables of 'attention' and 'memory' since the value in table below is (R=.357 P=.010 N=51). Results from the correlation between the two variables of emotion and impulsivity likewise illustrates (R= .479 P=.000 N=52). Finally, there is a noticeable relationship between the two variables of 'integration' and 'speech' at the level of (R=.522 P=.000 N=52).

Overall, it can be concluded that a noticeable correlation between variables has been established in some areas. However, depending on the three parameters of (R), (P), and (N), the strengths level of correlation could vary. Moreover, investigation shows

that attention impairments, as one of the core symptoms of ADHD, has correlation with two other ADHD impairments ('organisational and memory'), which is in line with the literature review (*e.g.* Baddeley, 2002; Gau and Chiang, 2013; Rosenblum *et al*., 2010).

Table 5-6: Correlation Test

		ATTENTION	EMOTION	SPEECH	MEMORY	IMPULSIVITY	ORGANISATIONAL	INTEGRATION
ATTENTION	Correlation Coefficient	1.000	.047	.182	.357**	.224	.566**	.123
	Sig. (2-tailed)	.	.741	.197	.010	.111	.000	.385
	N	52	52	52	51	52	51	52
EMOTION	Correlation Coefficient	.047	1.000	.015	-.023	.479**	.136	.369**
	Sig. (2-tailed)	.071	.	.915	.870	.000	.340	.007
	N	52	52	52	51	52	51	52
SPEECH	Correlation Coefficient	.182	.015	1.000	.496**	.088	.249	.522**
	Sig. (2-tailed)	.197	.915	.	.000	.535	.078	.000
	N	52	52	52	51	52	51	52
MEMORY	Correlation Coefficient	.357	-.023	.496**	1.000	.116	.433**	.205
	Sig. (2-tailed)	.010	.870	.000	.	.420	.002	.150
	N	51	51	51	51	50	50	51
IMPULSIVITY	Correlation Coefficient	.244	.479**	.088	.116	1.000	.202	.113
	Sig. (2-tailed)	.111	.000	.535	.420	.	.156	.424
	N	52	52	52	51	51	51	52
ORGANIZATIONAL	Correlation Coefficient	.566**	.136	.249	.433**	.202	1.000	.188
	Sig. (2-tailed)	.000	.340	.078	.002	.156	.	.186
	N	51	51	51	50	51	51	51
INTEGRATION	Correlation Coefficient	.123	.369**	.522**	.205	.113	.188	1.000
	Sig. (2-tailed)	.385	.007	.000	.150	.424	.186	
	N	52	52	52	51	52	51	52

* Correlation is significant at the 0.05 level (2-tailed) / **Correlation is significant at the level 0.01 (2-tailed)

Source: Derived from empirical data

5.7 Checking reliability (Cronbach's Alpha)

As explained in the methodology chapter (Section 3.15.1), reliability illustrates the extent to which the results of the research are truthful. In this respect, an internal consistency test was performed in order to examine the overall reliability coefficient for the set of variables provided in this study. Therefore, Cronbach's Alpha has been used to prove the reliability (internal validity) of the questions (variables). SPSS provided the two tables presented below. One of the tables refers to the reliability statistics that illustrate the real value of Cronbach's Alpha. The output is presented below in Table 5-7:

Table 5-7: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha, Based on Standardised Items	N of Items
.739	.751	14

From the table above, the Cronbach's Alpha calculation in the data set indicated an alpha coefficient of 0.739, which is accepted as a high level of internal consistency. Furthermore, the internal consistency examined the individual constructs; meaning the Cronbach's Alpha for each construct can be identified. Thus, Table 5-8 illustrates the item-total statistics. It can be seen from the last column on the right that Cronbach's Alpha is not less than 0.689, thereby illustrating a strong correlation between constructs.

Table 5-8: Items-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Attention	197.6486	292.068	-.040	.649	.764
Emotion	214.1892	268.991	.233	.405	.737
Speech	211.5676	253.974	.382	.656	.721
Memory	217.5405	264.866	.231	.656	.739
Impulsivity	212.0270	280.083	.207	.356	.737
Organisational	211.6486	276.956	.296	.617	.731
Integration	210.3514	242.512	.422	.478	.716
Language problem cause	218.5405	254.755	.555	.632	.707
Emotion problem cause	212.8649	247.509	.435	.508	.714
Poor attention cause	213.1892	238.435	.684	.725	.689
Poor working memory cause	217.9459	248.830	.610	.697	.700
Ability process information	214.0270	248.027	.341	.713	.728
Rapid fire mind	217.9459	269.497	.314	.612	.728
Hours of engagement	219.4595	248.422	.402	.766	.718

Source: Derived from empirical data

5.8 Conclusions

In summary, the statistical investigation aimed to verify the 'aetiological model of ADHD' and the strengths of ADHD developed from the literature review. Therefore, this chapter is structured according to the objectives outlined in the introduction chapter. Specifically, this section outlined the data analysis procedures followed by applying the Mann-Whitney and Correlation Tests. Surprisingly, the statistical results indicate that parents demonstrate higher levels of appreciation than professionals of the aetiological model of ADHD, particularly in relation to the strengths of ADHD strengths, which is in line with the qualitative findings presented in Chapter 4. For instance, the findings indicate a significant difference in the level of agreement with the variable of '***knowledge integration***' between the two groups of professionals and parents. Further investigation illustrates that parents display higher levels of appreciation of the statement compared with professionals.

In contrast, statistical results in some areas recognised similar impressions/awareness between the two groups. For example, statistical investigation into the '***speech***' variable indicates that both professionals and parents agreed on the existence of speech/language problem, such as co-morbidity, in ADHD children, which is in line with the literature (*e.g.* Jonsdottir *et al*., 2005) and qualitative findings (Section 4.3.2). Moreover, the statistical results show that more investigation is required into the level of agreement between the two groups with the idea of some ADHD impairments (*i.e.* impulsivity and memory). A Correlation Test has also been applied in order to determine any relationship between ADHD impairments. In addition, the study has checked the reliability coefficient using Cronbach's Alpha. Overall, the results of the following terms have been discussed in order to justify the aetiological model of ADHD. Moreover, this section has explored:

- the existence of impairments derived from the literature
- the relationship between impairments in level 1 (cognitive deficits) and level 2 (internal effects)
- the relationship between impairments in level 2 (internal effects) and level 3 (observable signs), and
- the different perspectives of professionals and parents at the level of

In the following chapter, the researcher will discuss findings of the study.

Chapter Six: Discussion of Findings

6.1 Introduction

The current chapter focuses on discussion of the overall findings of this investigation, provided in chapters 4 and 5, which emerged from various types of data collection/data analysis, including: teachers' observation, interviewing (experts, coaches, teachers, and parents), and questionnaires distributed between two groups: professionals and parents. This chapter will review the purpose of the research briefly. Following the review, research questions are provided and will be addressed through the empirical evidence. Theoretical and practical contributions derived from the results of the study will be summarised in each section. The chapter revises the 6Ms pedagogy model to present one of the critical pedagogy criteria, which is appropriate for children with special education needs (ADHD). The chapter will end with the conclusion.

6.2 Review of the Study

The term 'Special Educational Needs' (SEN) indicates a type of learner who engages with one or more of several learning difficulties (*e.g.* autism, dyslexia, ADHD). Literature investigation has revealed that the use of appropriate and effective educational pedagogy is vital to provide support and to help SEN learners to engage in the active learning environment in order to construct new knowledge. In fact, moving towards information and communication technology led teachers to realise the significance of teaching special needs children in order to address their educational/social demands and help them develop their learning in an effective manner. In this respect, the research undertaken here is intended to develop a model for designing educational pedagogy to support learners who are diagnosed with Attention Deficit Hyperactivity Disorder (ADHD). Surprisingly, little research has been conducted to examine the pedagogical elements of an instructional design for teaching ADHD children. Hence, the model is intended to enable instructors to design a specific pedagogy for a given lesson by assembling carefully chosen components, which are chosen for their suitability for a given purpose. To illustrate such an idea, the researcher must have considered challenges, different impairments, and strengths associated with

ADHD learners present in the class. In this way the 7Ms model facilitates coherent and controlled decision-making over the choice of pedagogy to achieve a specific learning objective, and enables planning for progression through the lesson by way of transitions in pedagogy that may occur over the period of a learning episode. Furthermore, the initial guidelines provided in table 4.2 serve to link pedagogy criteria to the impairments and strengths of specific types of ADHD learners, and the demands on learning. Accordingly, the design of pedagogy is even more sensitive to the particular needs of learners. The present study is defined by the following research questions, which will be addressed further in this chapter.

- What makes ADHD children different from typically developing learners? In other words, what are the specific ADHD impairments and advantages that might play significant roles in academic and social life contexts?

- How do different groups of ADHD experts, ADHD coaches, teachers, and parents consider ADHD in respect of learning?

- What are the differences between the perspectives of professionals and parents on ADHD strengths and impairments?

- What are the different roles taken by teachers in the classroom and how can different roles coordinate to help learners through different challenges?

- How can a suitable pedagogy be designed that can help ADHD learners with their academic achievements?

6.2.1 Overview of research outcomes

There are several facets to the research that cohere to produce a model of pedagogy, which supports the process of instructional design specially for learners with ADHD. The three facets are briefly presented below:

1. The set of (four) ADHD models depicting alternative understandings of the aetiology of ADHD symptoms and signs from the perspective of four central

actors (roles) involved in education of ADHD learners: parents, teachers, coaches and professionals (e.g. psychologists). *Significantly, these models are conceived from the point of educational diagnosis rather than clinical diagnosis, and therefore, are more suited to application in an educational setting than existing alternatives (e.g. Brown, Barkley)*. Furthermore, the set of models serves also to draw attention to the fact that multiple consistent models of ADHD are a more authentic representation of common understanding among different stakeholders than any one particular idealised model (as currently predominates in the literature). Collectively the set of models developed here succeeds in offering the literature new insights in to the interpretations of behaviour derived by different stakeholders, each of whom has a different purpose (e.g. didactic, developmental) in understanding the mechanisms of ADHD. And, importantly, results here signify that such models, although being alternatives derived from different perspectives, are nonetheless consistent and non-contradictory.

2. The 7Ms model of pedagogy comprising seven dimensions that combine to produce a schema from which a lesson plan can be constructed. Notably, the schema represents one pedagogy at an instance in time fixated on a specific learning objective. As learning objectives proceed so the schema supports construction of additional pedagogies, and thereby entails transition and progression in pedagogy that mirrors the same in learning goals and intended learning outcomes. *This ability to model transitions in pedagogy in a controlled manner achieves a considerable improvement over existing pedagogy* d*esign approaches that are static in nature*. The literature on instructional design is therefore enhanced by the inclusion of the 7Ms model and its explicit treatment of multiple dimensions. *Perhaps most notable for the literature is the way in which the 7Ms model operationalizes pedagogy transition through the various dimensions it comprises.*

3. The guidelines provided in table 4.2, in which characteristics of ADHD (such as impulsivity) are cross-referenced with the demands of learning experiences, offers a tentative reference scheme for determining amongst available options in the pedagogy design process. *In recognising the link between ADHD*

> *impairments (and advantages) and the demands placed on learners from particular learning theories and approaches, the work extends current understanding of educational interventions for SEN in general, and ADHD in particular*. It is now more apparent why interventions may or may not work successfully for individuals in specific situations because instructors can tie in the functions of any intervention with the demands of a learning task and the effects of ADHD in that situation. Thus, literature on SEN intervention is both extended through the cross-referenced table, and it becomes more transparent due to the explicit connexions contained within.

The three facets of this research each offers something valuable and novel to the literature independently. However, the main contribution is achieved when they are integrated in to a mechanism for planning instructional design at the level of pedagogy transition, which recognizes the central importance of role adoption and switching in response to changing circumstances – where a circumstance is defined by the learning goals, the demands of the learning experience, and the capabilities of the ADHD learner (in that particular situation). ***Thus, the integrated model as described is offered to the literature as the main original contribution of this research***.

6.3 Discussion of Findings

6.3.1 Develop a Pedagogy Model: (6Ms)

This section emphasises the differences of the 6Ms pedagogy model developed for the purpose of this study and the previous recent pedagogy models. Prior research on educational pedagogy indicates that pedagogy refers to the instructional design and approaches to teaching practice (Thompson, 2006). As such, three pedagogical models of Merrill (2002), Huitt *et al*., (2009), and Conole *et al*., (2004) have been reviewed in the literature chapter. The principles of Merrill's model propose that the most effective learning environments involve problem-based learning, where the learners are actively engaged in the learning process and apply their prior knowledge in what is called a '*learner-centered*' approach, whilst in the 6Ms pedagogy model, the researcher has offered '*model of learning*' as simply **one** of the pedagogy criteria to facilitate the learning process. In this respect, the constructivist model of learning as one of the learning theories emphasises the learner-centered approach, where the learners construct

new knowledge from their prior knowledge (*e.g.* MacPhail *et al*., 2013). Therefore, this has been identified as a major difference between Merrill's pedagogy model and the 6Ms model.

By contrast, the other two models of Huitt *et al*., (2009) and Conole *et al*., (2004) proposed a general pedagogy model. Model of Huitt and his colleagues presented four different dimensions: presentation, practice, assessment and evaluation, and feedback. More specifically, each pedagogy dimension consists of a set of instructional events aimed at supporting learners to successfully manage their learning. Interestingly, the purpose of this model is similar to the 6Ms model and it is suited as an educational model for teaching typically developing learners (TDLs); however, it may not necessarily an accurate and perfect pedagogical model, since the implications of pedagogy for teaching special educational needs (ADHD) have not been covered yet. Additionally, although, the 3-D pedagogy framework developed by Conole *et al*., (2009) has similar idea on designing effective pedagogy framework, it did not map all pedagogical dimensions require for supporting special education needs.

Importantly, recent studies also focused on '*the challenges of changing pedagogy*', aiming to develop the quality of education and teaching (Murphy and Wolfenden, 2013). In this respect, a number of research projects have integrated technological pedagogical science knowledge (*i.e.* ICT) into the educational pedagogy (Jimoyiannis, 2010; Chai *et al*., 2011; Ertmer and Ottenbreit-Leftwich, 2013). It is important to note that one of the significant pedagogy criteria that has been offered by the 6Ms model is named '*medium of delivery*', which consists of ICT aspects (*e.g.* web-based, social media, multimedia, computer-based, *etc.*). Unfortunately, teachers have infrequently applied ICT in the classroom in order to support learners constructing knowledge. However, ICT is simply being used for information delivery.

Evidence from the literature illustrates that although numerous studies have been conducted on instructional design and educational frameworks, prior researchers widely cited ICT (e-learning) and/or learning theories (*e.g.* constructivist-learning) in pedagogy models. This indicates the lack of a specific pedagogy model not simply focused on a couple of learning approaches but also considering all aspects of lesson plans. As a result, findings from the current research claim the existence of a research gap in order

to develop an accurate pedagogical model. More precisely, this section of the study has provided a novel pedagogical model (**6Ms**) consisting of six criteria aimed at providing support for typically developing learners as well as children with special education needs, particularly ADHD. The 6Ms pedagogy model is considered to be a product that develops from a decision taken about a set of significant dimensions of learning which has not been discussed as a complete package of the lesson plan. As such, the 6Ms pedagogy model offers significant pedagogy criteria, including model of learning, mode of engagement, method of facilitation, medium of delivery, manner of feedback, and map of content. It is important to note that each dimension may have previously been studied by other researchers; however, the 6Ms is presented in this study as a new pedagogical model, which is based on integration approaches in the educational context.

Table 6-1 presents prior studies on the pedagogy model aiming to offer a novel pedagogy model in the current research. Areas shown with ticks represent the specific pedagogy criterion that has been investigated by other authors and the crosses represent further investigation required. In addition, there are other blocks presents the particular learning criterion that has been investigated within other learning criteria. Thereafter, the first column on the right from the table below identifies the 7M-pedagogy criterion, 'Mind perspective', which will be added into the pedagogy model later in this chapter (Figure 6-1). Investigation illustrates that little research has considered the mind perspective as a pedagogy criterion or a lesson plan (e.g. Huber, 2010; Tirri, 2011). It is important to note that Huber has looked at the mind perspective within 'caring for students' in a way to examine "*what caring for students requires them to do*" (p.71). Slight similarity has been observed in the role of the teacher between the researcher's idea and Huber's perspective. Furthermore, Tirri (2011) identified a pedagogy model of wellbeing schools, which refers to the environment surrounding of the school. Importantly, this perspective has not been considered in the current study.

Table 6-1: Pedagogy Table

Pedagogy models	Pedagogy criteria (7Ms)						
	Model of learning	**Mode of engagement**	**Method of facilitation**	**Medium of delivery**	**Manner of feedback**	**Map of content**	**Mind perspective**
Merrill (2002)	***Within Mode of Engagement*** ✓	✓	✓	***Within Method of facilitation*** ✓	×	×	×
Huitt *et al.*, (2009)	×	×	***Within Medium of delivery*** ✓	✓	✓	×	×
Stevenson (2008)	×	✓	✓	***Within Method of facilitation*** ✓	***Within Mode of Engagement*** ✓	×	×
Mccormick and Scrimshaw (2001)	✓	***Within Medium of delivery*** ✓	×	✓	✓	×	***Within Medium of delivery: ICT*** ✓
Lunenberg and Samaras (2011)	×	***Within Method of facilitation*** ✓	✓	×	×	×	×
Ertmer and Ottenbreit-Leftwich, (2013)	✓	***Within Method of facilitation*** ✓	✓	✓	×	×	×

MacPhail *et al.*, (2013)	✓	***Within model of learning*** ✓	***Within model of learning*** ✓	×	×	×	×
Gore *et al.*, (2004)	×	✓	×	×	×	✓	×
Moloi *et al.*, (2008)	×	✓	***Within Mode of Engagement*** ✓	×	✓	×	×
Aoki (2012)	✓	***Within Medium of delivery*** ✓	×	✓	×	×	×
Huber (2010)	×	×	×	×	×	×	***Within the role of teacher*** ✓
Tirri (2011)	×	✓	×	×	×	×	***Within wellbeing*** ✓

✓ *Represents prior investigation on particular learning criterion within specific study*

× *Represents no investigation within specific study*

Source: Derived from empirical data

Interestingly, the pedagogy model has been tested in the real environment among special teachers. Findings from teacher observations (section 4.3) have verified the 6Ms pedagogy model as an accurate pedagogy model for typically developing learners. However, an important pedagogy criterion has been missed from the 6Ms model which directed the researcher to further investigation on ADHD and impairments.

6.3.2 Develop an Aetiological Model of ADHD

According to the prior section, examining the 6Ms pedagogy model has shown that the model is accurate for typically developing learners, whereas revisions are required in order to use the pedagogy model for teaching ADHD children. Therefore, the researcher sought to determine different ADHD symptoms and the link between different impairments (*e.g.* Stern and Shalev, 2013) from different perspectives (*e.g.* experts, coaches, teachers, and parents). Among all these, the study has primarily considered two significant ADHD models, including Brown (1997) and Barkley (2005), which are explained in Chapter 2. In fact, this section focuses on the differences between the two models of (Barkley and Brown) and the aetiological model of ADHD, which was developed for the purpose of the study.

Evidence from this study illustrates that the two models of Barkley and Brown are considered being as a single perspective named '*clinician perspective*' which is suited to a diagnostic perspective but not necessarily a teaching perspective. Importantly, this was the reason why the researcher has offered the aetiological model of ADHD as a novel model, considering not simply the clinician perspective, but also considering multiple perspectives. The central viewpoint of the researcher was laid on multiple roles consisting of **expert role:** Clinical/diagnostic perspective; **coach role:** Developmental/ life & work management perspective; **teacher role:** Diagnostic/didactic/pedagogic perspective; and **parent role:** Wellbeing/emotional/daily life perspective. In addition, the aetiological model has been employed as an educational perspective. Accordingly, three more perspectives have been added into the prior research. More precisely, comparing experts' aetiologic model presented in Chapter 4 with the models of Barkley (1997) and Brown (2005) illustrates that the models may not be identical but they are consistent. This is mainly because the aetiological model has similarly looked at the executive function (EF), which is presented as level 1 (L1: cognitive deficit) of the aetiological model. Moreover, it has detailed the link between different ADHD

impairments. Essentially, two more levels of L2: internal effects, and L3: observable signs have also been identified through literature investigations.

Interestingly, the extension of this study also has looked at the '*capability approach*', which refers to the positive aspect of ADHD children (sections 2.9, 4.11.2, and 4.12); however, both Barkley and Brown's models have not considered the advantages of being ADHD in their models. As a result, the study aims to incorporate the aetiological model of ADHD to the 6Ms pedagogy model intended to design an applicable pedagogy model for special needs children, particularly those who are diagnosed with ADHD. Among all these, the model directs the researcher to identify another pedagogy criterion named '*Mind perspective*' that has to be added into the 6Ms pedagogy model.

6.3.3 Develop an Appropriate Pedagogy Model (7Ms) For Children with ADHD

Although previous studies have investigated the phenomenon of pedagogy over the years (*e.g.* Merrill, 2002, Huitt *et al*., 2009), there is no specific widely established definition to interpret pedagogy. Furthermore, the choice of suitable pedagogical dimensions is vital in order to teach ADHD children. The data analysis conducted in this section was an in-depth investigation of the ***6Ms*** pedagogy model which has been derived from the literature investigation (Chapter 4). As explained earlier in section 6.3.1, analysis of the observation data obtained from classroom teachers has validated the *6Ms* pedagogy model. This means the six pedagogy criteria, including Model of learning, Mode of engagement, Method of facilitation, Medium of delivery, Manner of feedback, and Map of content that have been developed in this study were verified and have matched practices through teachers' observations.

Evidence from data analysis illustrates that each individual pedagogy criterion was entirely compatible with the existing teaching pedagogies used in the real classroom environment. As such, it addresses the effectiveness of the '6Ms' pedagogy model and is confirmed as a useful teaching pedagogy for typically developing learners as well as special educational needs. Interestingly, researchers' evaluation from teachers' observation has expounded a new insight into the pedagogy design. In this respect, revising the 6Ms pedagogy model required since a key component from the model has

not been considered yet. Following this, according to the empirical investigation, '***mind perspective***' as a 7M needed to be added, with the purpose of focusing on the significance of different roles that have been taken by special teachers. In particular, the empirical data reveals that the modified and validated 7Ms pedagogy model is an efficient novel teaching model to provide support for ADHD learners. Since the revised model offered a lens to explore this critical component of pedagogy, the implication described below would address the research question: '*What is a suitable pedagogy design that can help children with their academic achievements?*'

- While the six pedagogy criteria proposed in the 6Ms pedagogy model are verified, there is also another component of pedagogy, which is established and validated, and has emerged from the empirical investigation. This has modified the model into the **7Ms** pedagogy model which represents different roles of teachers/teacher assistants in the classroom environment. Investigation illustrates the significance of the four roles that teachers might change during the lesson in order to support ADHD children with the learning performances. The four roles might be varying between expert, coach, teacher, and parent. As such, different roles expound special perspectives including **expert role:** Clinical/diagnostic perspective; **coach role:** Developmental/life & work management perspective; **teacher role:** Diagnostic/didactic/pedagogic perspective; and **parent role:** Wellbeing/emotional/daily life perspective. Evidence from classroom observations prove that the teacher's different roles could be a very effective strategy for a child with ADHD since several chronic challenges (*i.e.* emotional, behavioural, learning) might appear during the learning episode.

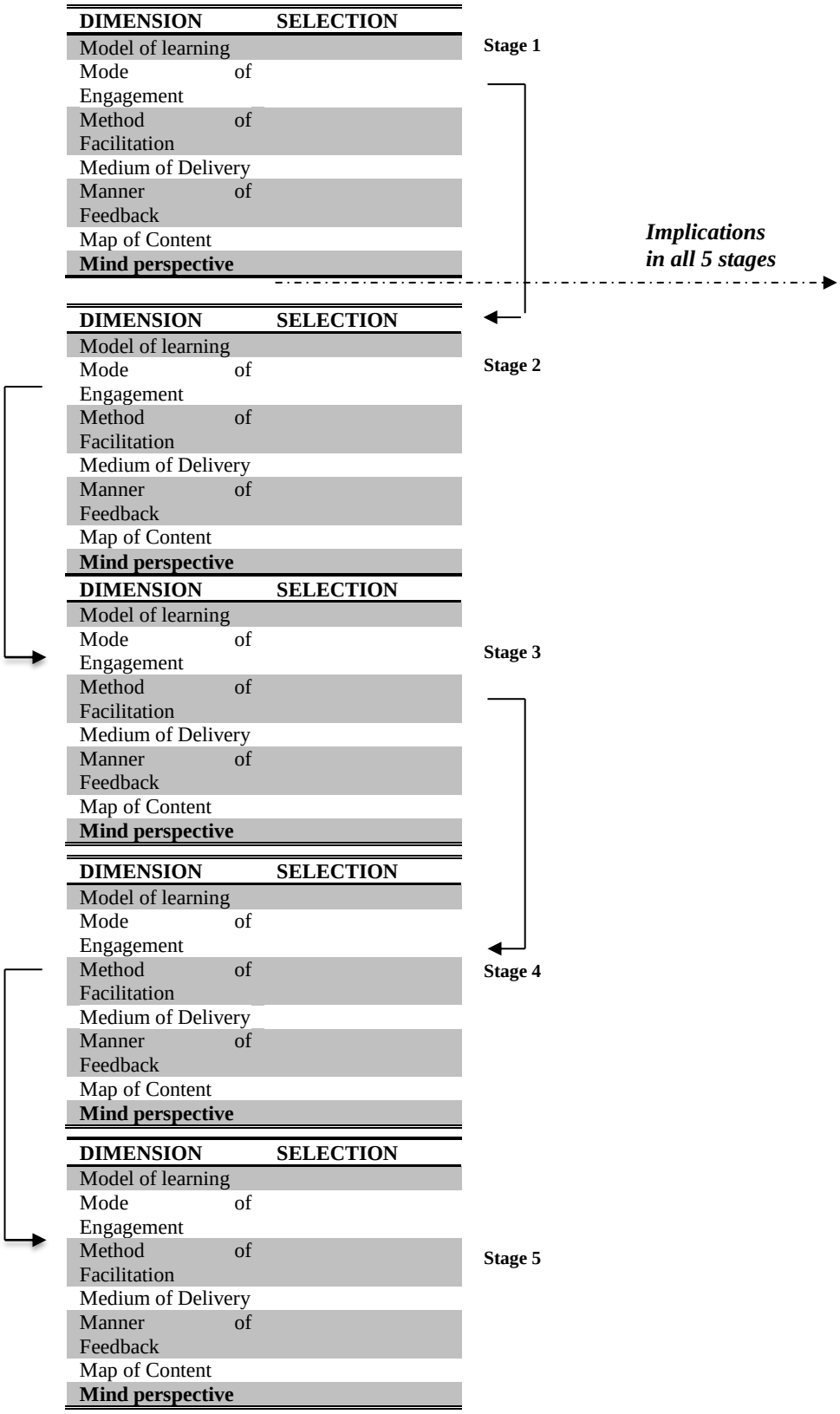
Evidence from special teachers' discussion, their opinions, and feedback (didactic perspective) on the 7Ms model indicates the validity of the model. Importantly, in terms of mind perspective, a teacher's initial role is that of an educator. The didactic role, essentially working with special education needs, tends to carry over into other areas. Therefore, it is vital to note that, depending on the needs of ADHD children, the most appropriate approach is required to deal with a child's specific limitation. Overall, some children may need firmer boundaries whereas others may need a gentle reminder and/or prompt. As a result, the study has contributed to the development of a pedagogy model

comprising appropriate didactic interventions to support ADHD children with their learning requirements.

Although studies by MacFarlane and Woolfson (2013) applied different theories (i.e. the theory of planned behaviour (TPB)) to examine the link between teacher attitudes and behaviour toward children with special education needs, there is still a gap, which shows they have not investigated different roles of teachers that might be taken within the class. Review of the literature shows that although studies have been conducted for special education needs, results of the current study have added knowledge to prior research that different roles of teachers are beneficial in helping ADHD children with their learning problems such as group working difficulties, emotional problems, distractibility, focus, etc. For example, imagine the teacher chooses a 'peer-to-peer discussion' as a method of facilitation. Of course, there should be interactions between two students in order to engage in a particular task. What is significant is whether any of children who have social difficulties (*i.e.* peer-rejection, failure to collaborate) can really participate in such a task with no difficulty. Therefore, the special education teacher/teacher assistant's role here is to change to the parental/coaching role in order to provide support and assist children in an efficient manner.

Mind perspective as a significant pedagogy criterion expounds different roles that teachers might take during teaching process, which underlies higher academic performance of ADHD children. In fact, the model argued with special teachers has been confirmed, supported, and validated as a novel model of pedagogy. Overall, the researcher believes that the 7Ms pedagogy model is a new practical teaching framework that works well as a lesson structure for school teachers who are teaching ADHD children. Figure 6.1 below illustrates the revised lesson structure which is introduced as a **7Ms** pedagogy model.

Figure 6-1: Revised Lesson Structure



Source: Derived from the empirical data

6.4 Addressing Research Questions

6.4.1 ADHD Impairments vs. Learning

Data analysis conducted here revealed that there are specific ADHD impairments that make learning even more difficult. In order to answer an early research question: '*What makes ADHD children different from typically developing learners? In another words, what are the specific impairments/advantages that might play significant roles in academic and social life contexts?*' literature investigation and empirical findings into ADHD weaknesses/strengths and academic performance directed the researcher to establish to what extent ADHD learners are able to satisfy the essential requirements for learning to be viable.

Evidence from literature illustrates that ADHD children are potentially incapable of meeting the learning demands (e.g. Loe and Feldman, 2007). Children with ADHD show significant educational underachievement, poor academic performance and poor learning outcomes. Unfortunately, this allocates the ADHD child into a category of educational disability and may differentiate them from typically developing learners. However, in terms of positive aspects, it is important to note that it frequently happens that ADHD children express numerous advantages/strengths such as hyper focus, rapid-fire mind, idea generator or being creative, multitasking, and visual information processing in the classroom or at home, which is in line with the literature (*e.g.* Tymms and Merrell, 2011; White and Shah, 2006; 2011). Findings of this study present an appropriate educational intervention called the 7M pedagogy model aiming to provide support and improve children's advantages/strengths towards learning goals.

6.4.2 Different Views on the Aetiological Model of ADHD

Data analysis conducted in this section suggested a novel approach in the area of ADHD and the educational context in terms of the idea of four perspectives in viewing the aetiological model of ADHD, which builds an empirical contribution. In order to answer the research question: '*How do different groups of ADHD experts, ADHD coaches, teachers, and parents consider ADHD*?', analysis of interview data achieved from ADHD models suggested that there were significant similarities as well as a number of differences between four groups of experts, coaches, teachers, and parents.

Evidence from empirical investigation indicates that all four ADHD models show similarities in several aspects. Perhaps the significant similarity between four participants was related to the findings that all experts, coaches, teachers, and parents believe in a set of impairments associated with ADHD children such as:

- Inattentiveness/Poor focus
- Poor working memory (long-term/short-term memory)
- Language deficit/Auditory problem
- Behavioural impairments
- Emotional disorder
- Poor organising/Poor managing
- Poor social skills/Poor communication
- Not following instructions/rules
- Poor literacy skills, and
- Distractibility/Disruptive behaviour.

Accordingly, the study shows that findings from the empirical investigation are in line with the literature review since enormous amounts of research have examined the complexity of ADHD disorder (*e.g.* Barkley, 1997, 2003; Kovac, 2001; Barkley and Gordon, 2002; Brook and Boaz, 2005; Watkins and Wentzel, 2008; Wodka *et al*., 2008; Wehmeier *et al*., 2010; Donfrancesco *et al*., 2011).

In contrast, this research reveals that the level of awareness among four groups of experts, coaches, teachers, and parents is not similar in drawing particular views. In experts' discussions, three levels of impairments (L1: Cognitive deficit; L2: Internal effects; and L3: Observable signs) have been discussed. It is important to note that experts have classified cognitive functions as a central concern in the ADHD context. As such, they precisely focused on self-regulation, which seems to be a dominant feature of the executive function. This was evidence that experts' view were compatible with the level 1 in the aetiological model of ADHD described in Chapter 4. Overall, a large portion of experts' concern was based on the Clinical/Diagnostic perspective, which offers a worthwhile means of approaching the analysis.

In parental discussion, by contrast, level 1 'cognitive deficit' was not explained precisely since it clearly shows sensitivity and emotional perspective for a parent of a child with ADHD. Parents primarily give attention to observable challenges associated with ADHD rather than the nature of functions of the brain. Furthermore, evidence from parental discussion shows that they are struggling with decisions about '*correct medication'* as well as hoping for school teachers' understanding of the child's diagnosis in order to provide support and help them overcome their academic limitations. Interestingly, the idea of choosing the correct medication is widely supported by the literature review (*e.g.* Faigel *et al*., 1995; Watkins and Wentzell, 2008; Rogers *et al*., 2009; Brinkman *et al*., 2011; Pajo and Stuart, 2012).

As highlighted in Chapter 4, ADHD coaches provide support for their patients, both children who suffer from ADHD and parents with ADHD children to help and direct them achieve their social and academic goals. This was the reason why coaches primarily emphasise behavioural disorder and social impairments, which formed level 2 and level 3 of the aetiological model of ADHD. In fact, what coaches do represents their role as developmental/life and work management, which helps children to successfully manage their ADHD.

Turning to the final group, teachers' viewpoint interestingly covers all three levels (L1, L2, and L3) in the aetiological model of ADHD. However, '*didactic perspective*' of teachers represents that special teachers more consider observable signs/challenges associated with ADHD. Teachers provide several challenges for ADHD children. In fact, this is because the more demands there are from teachers. The more problems and learning difficulties become visible. Therefore, teachers' role is vital and directly influences both behavioral and academic performance of children.

To conclude, the analysis of such differences and similarities within experts, coaches, teachers, and parental discussions proposes four ADHD models, which indicates four different views from the aetilological model of ADHD presented in Chapter 4 (Part one). The alignment of four accounts of participants illustrates the varied types of knowledge in the area of ADHD, different impairments, and the link between impairments, enabled the researcher to validate the novel aetiological model of ADHD. Furthermore, this model will help pedagogy designers to select the correct choices of

pedagogy criteria for children who suffer from ADHD, based on their academic demands.

6.4.3 Teachers' role

Specific research question that rose from the present study '*What are the different roles taken by teacher in the classroom and how can different roles coordinate to help the learner?*' have been defined as practical contributions outlined below:

- Teachers' participation in this research was vital since they offer four different roles (expert, coach, teacher, and parent) in the classroom in order to successfully teach ADHD children. Teachers' roles present dominant perspectives of them including: diagnostic/pedagogic/didactic perspectives. Interestingly, this approach is all in relation to observing a child's behaviour, emotions, education and cognitive skills, and social life. In this regard, the model developed by teachers has also contributed to three levels of L1: Cognitive deficit; L2: Internal effects; and L3: Observable signs, which are compatible with the literature model (Barkley, 1997; 2003). However, it is important to note that teachers' main focus is related to L3: observable signs.

  As explained earlier, in order for a teacher to address observable challenges that are associated with ADHD children, they might have altered their role, based on educational goals, as a teacher to expert, coach, or parent. For instance, often, correct recognition of diagnosis is necessary in order to provide support for particular academic demands of a child. This would require the expert's role '*diagnostic perspective*' of teacher (*i.e.* ADHD, ADHD +, learning disabilities, Autism, Dyslexia, *etc.*). On the other hand, it is natural for ADHD children to feel depressed/anxious/aggressive or often show low self-confidence/self-esteem during the lesson. Therefore, the teacher's role (didactic perspective) would need to turn to a parental role, '*emotional perspective*'. As such, teachers should understand the child's situation, provide emotional support, and accommodate the child's demands to help get their attention back to the lesson.

  Since parents of ADHD children are part of the ADHD phenomenon, so teachers also rely on parents' educational/emotional support. Parent training may help

families not simply learn more about different symptoms/challenges, but also guide parents how to successfully manage their children's behavioural disorder. This presents the '*coaching perspective*' of teachers in order to give them opinions or knowledge about their children's condition, treatments and educational interventions. Overall, characteristics of ADHD appear differently, since ADHD versions are varied. Therefore, this is the reason why teachers' role should be flexible during the learning episode, depending on different educational goals, in order to provide children with academic support. While educational goals are changing within the lesson, teachers may employ a specific pedagogy criterion targeting particular limitations/learning weaknesses of children. This illustrates the link between educational goals and the critical roles of teachers/teacher assistant in the classroom environment, which presents mind perspective.

6.4.4 Differences between Professionals and Parents' Idea on ADHD Aetiological Model

Although qualitative studies have examined the aetiological model of ADHD through four groups of experts, coaches, teachers, and parents, the quantitative study also has been employed in order to validate the model through two groups of professionals and parents. As explained in Chapter 5, sixty-seven questionnaires were received from two groups of professionals and parents while the dataset remained at fifty-two usable questionnaires. Data collected from two groups of participants were analysed via SPSS (Non-Parametric Statistical Test) since the data from the study were not normally distributed. Results of normality were tested through inspecting the Shapiro-Wilk statistic. As such, data were analysed via the Mann-Whitney Test as an appropriate statistical procedure in order to detect whether there were any significant differences between two groups of professionals and parents on a set of ADHD impairments/ strengths, and the link between different impairments/strengths. Surprisingly, statistical outcomes indicate that parents express higher levels of appreciation of the aetiological model of ADHD than professionals, especially on ADHD advantages. Findings explain that sensitivity and emotional perspective of parents might lead them to agree to ADHD strengths statements.

Statistical findings in some areas, by contrast, represented similar impressions/ awareness between two groups of professionals and parents. For instance, investigation on the '***speech***' variable illustrates that both professionals and parents were agreed on the existence of the language problem among ADHD children, which is in line with the literature (*e.g.* Gut *et al*., 2011). In summary, it is important to note that further investigation is required on the level of agreement with the idea in particular ADHD impairments (*i.e.* impulsivity and memory) between two groups of parents and professionals.

6.5 Conclusion

The current chapter offered validation for the aetiological model of ADHD for analysing and exploring how different people (experts, coaches, teachers, and parents) viewed the proposed model. The validated model firstly offered new insights into the roles and different perspectives including **expert role:** Clinical/diagnostic perspective; **coach role:** Developmental/life & work management perspective; **teacher role:** Diagnostic/didactic / pedagogic perspective; and **parent role:** Wellbeing/emotional/ daily life perspective. Presented roles would be an effective lens to develop an educational pedagogy for special educational needs, particularly ADHD children. The chapter then offered revision and validation of the 6Ms pedagogy model. The revisions suggest that the pedagogical model would be more valid and effective if it takes into consideration the '**Mind perspective**' which requires changing the model into the 7Ms pedagogy model. The revision firstly proves the 6Ms as an effective pedagogy framework which supports both typically developing learners as well as special needs, and secondly explores different roles that a special teacher/teacher assistant might take during the learning episode.

This study shows that prior research was not clearly investigated at an appropriate pedagogical model for ADHD children in order to provide support and help them with their academic limitations. This inadequate investigation in the area of special needs proves that several substantial factors were missed. Ultimately, the argument endorses the applicability of the revised version of the 7Ms pedagogy model which is associated with the special educational context. Overall, discussion in this chapter provided a comprehensive understanding of five stages of the study, as seen below:

- Determine pedagogical principles to develop a literature-based pedagogical Model (***6Ms***)

- Verification of pedagogical Model to approach to a suitable pedagogy schema for ADHD learners

- Develop an aetiological model of ADHD associated determinants of learning from the perspective of multiple stakeholders

- Verification of an aetiolological model of ADHD

- Develop an empirical ***(7Ms)*** pedagogy model appropriate for ADHD learners.

Finally, the following chapter will discuss critical conclusions of this thesis.

Chapter Seven: Conclusions

7.1 Introduction

Chapter six discussed the outcomes and delineated the central outlines, and answered the research questions step-by-step through consideration of, firstly, the '6Ms pedagogy model' and revising the components and dimensions to the '7Ms pedagogy model' and secondly, focusing on the 'aetiological model of ADHD' and different perspectives. The chapter then covered discussion of findings and the implications within the study. This chapter will discuss linking between research novelty and gap of the study. The chapter will then focus on theoretical and practical contributions. Moreover, it deliberates the boundaries and limitations of the study, and lastly it will cover the possible future research in which to expand the area of study and the findings of this thesis.

7.2 The link between research novelty and the gap

Results from the current research indicate that the researcher has successfully addressed the research questions, research aims, and objectives as promised. Literature investigation in this study represented the novel aetiological model of ADHD, which was confirmed and validated through both qualitative and quantitative examination. The model has firstly been supported by four groups of experts, coaches, teachers, and parents. Hereafter, two groups of ADHD professionals and parents verified the aetiological model of ADHD. Importantly, the model intended to explore different ADHD symptoms/impairments as well as identifying the link between impairments. In addition, the model expands the understanding of three levels of L1: cognitive deficit, L2: internal effects, and L3: observable signs. As explained in Chapter 4, this research intended to bridge the gap that exists between the reasons behind individual ADHD impairments and how to deliver learning (using different educational strategies) materials in order to provide support for ADHD children and help them overcome their academic limitations. This study therefore contributes to the body of knowledge by developing a 7Ms pedagogy framework which aims to direct special education teachers

(lesson designers) to follow each stage of the framework in order to teach ADHD children and engage them with the lesson.

7.3 Contributions

7.3.1 Theoretical Contributions

This study is actually the first research which contributes two novel models, named 'the aetiological model of ADHD' and '7Ms pedagogy model', in the educational context. In this regard, the theoretical and practical contributions of this study are very supportive in helping ADHD children with their academic performance, in offering significant and new insights in enhancing the present level of understanding of special education needs. Therefore, theoretical contributions can be seen in the dimensions below:

- The study provides comprehensive and rich exploration of the impairments and strengths associated with ADHD children in an academic context. This research offer a lens to an interesting area of special education needs (SEN) children, which requires both theoretical and empirical consideration to accumulate an inclusive knowledge in the pedagogical literature. As discussed in the literature review in Chapter 2, investigation reveals further studies in the field of ADHD (e.g. Tymms and Merrell, 2011) and educational interventions support ADHD children (e.g. Brook and Boaz, 2005; Loe and Feldman, 2007; Efstratopoulou *et al*., 2012). Therefore, the current study responds to these calls both theoretically and practically, and found different levels of ADHD impairments/limitations, which potentially can change into advantages. The result shows the importance of the ADHD impairments, particularly cognitive deficit and its influential effects on the academic performance of children.

- One of the significant bodies of the literature in pedagogy was based on pedagogy dimensions (Blatchford *et al*., 2003; Gore *et al*., 2004; Lunenberg and Samaras, 2011). In fact, the researcher strengthens this area of literature by investigating and testing in the real classroom environment in order to validate the proposed pedagogy model, aiming to introduce it as an accurate framework. The findings considerably add to the understanding of the pedagogy dimensions through highlighting different roles of teacher/teacher assistant that might be

taken in the classroom, and influences in the learning performance of ADHD children.

7.3.2 Practical Contributions

- In order for ADHD learners to benefit from learning materials delivered by special teachers, it is necessary to adopt suitable educational pedagogy and interventions that will support these learners in coping with the demands of learning. The 7Ms pedagogy schema introduced in this research permits lesson plan designers to make reasoned and controlled decisions about the options of pedagogy criteria and transition in pedagogy over the period of a learning episode. This has been offered as one of the primary practical contributions.

- By relating the pedagogy criteria to the strengths and weaknesses of specific ADHD learners (i.e. poor motivation, poor information processing, poor knowledge integration and/or co-morbidity including autism or dyslexia), designing appropriate pedagogy is even more sensitive to the particular needs of a group of learners. In this respect, a tentative guideline has been offered in order to help pedagogy designers to make the best decision on the choices of pedagogy aiming to provide support and help children overcome academic limitations.

- Different roles of special teachers/teacher assistants in dealing children with special needs, particularly ADHD children, were found to be essential. The movement of teachers through different roles of expertise, coaches, teachers and parents, which all offer different perspectives, is necessary during the class, that has been approved in this research. In this way, the higher academic performance of children can be achieved. Therefore, schools and teachers are required to pay sufficient attention to the roles mentioned that can be taken by teachers during the learning episode.

7.3.3 Methodological Contributions

- Investigation illustrates that there are insufficient triangulation methodological studies including secondary analysis, qualitative, and quantitative method in the field of special educational needs due to the difficulty in approach and in

collecting the data from all participants of ADHD experts, coaches, special teachers, and parents through interview, observation, and online survey. Previous studies primarily collected data from children and parents and applied a single methodological stance (either qualitative or quantitative) (e.g. Guerin *et al*., 2009; Shimoni *et al*., 2012. As a result, methodological contribution can be realised in strengthening the aetiological model of ADHD to explore different perspectives of the model in presenting different levels of ADHD impairments and the link between individual impairments and strengths. Additionally, such a methodological approach has proved the aetiological model of ADHD as a novel model in helping pedagogy designers to develop appropriate educational strategies for children with special educational needs.

7.4 Limitations of the study

Approximately every research has limitations, which identify possible weaknesses of the research. According to Marshall and Rossman (1999, p.42), "*No proposed research project is without limitations; there is no such thing as a perfectly designed study*". However, some limitations provide opportunities for further investigations, which are outlined as below:

- One of the important limitations to the current research was the size of samples in both qualitative and quantitative study. Since the sampling type was a convenience approach, there were limited numbers of ADHD experts and specialists in the UK whom the researcher could reach. Moreover, experts who participated in this study had busy schedules, so they often refused to have a long interview process.

- This research adapts an exploratory and descriptive approach in order to validate an aetiological model of ADHD. To do so, the researcher applied critical realist approach to "*understand*" ADHD impairments/academic limitations in different levels of ***L1:*** Cognitive, ***L2:*** Intermediate level, and ***L3:*** observable signs and '*assumed*' its causal relationships through literature investigation. However, it is important to note that the researcher cannot prove 'the aetiological model of ADHD' as a 'causal Model'. Furthermore, evidence from both qualitative and

quantitative data analysis that emerged from this section illuminates the link between different ADHD impairments/strengths rather than causal relationships between impairments. Therefore, further research requires investigation of the causal relationships between different ADHD impairments/symptoms in order to prove the model of this thesis as a "causal model".

- This study has developed the pedagogy model as a lesson structure to provide support and help ADHD children with their academic limitations. The study additionally emphasises the implementation of the 7Ms pedagogy model in the real classroom environment where ADHD children are included and seeks to approve that the model is, in practical terms, an effective educational pedagogy model. This has referred to the limitation of the study and directs other researchers for further investigation.

7.5 Recommendations for further research

The implications from this research will be advised as practical recommendations for further investigation. Recommendations outlined as below have either emerged from the literature investigation or are directly made from results of the study.

- The 7Ms pedagogy model was developed and approved in the context of ADHD, therefore examining and testing the model for other types of special education needs such as Autism Spectrum Disorder, Dyslexia, Sensory Processing Disorder, Children with Learning Difficulties will approve the reliability of the pedagogy model and validate the findings of the study.

- This research has focused on four critical roles, including expert, coach, teacher, and parents that a teacher/teacher assistant might take during the teaching process. However, the roles might not end up with these four mentioned roles. In this respect, the researcher recommends future research to look at other roles such as another student or peer in order to help ADHD children with their learning and approach to better results of academic performance. However, this means including ADHD students in the research to develop another aetiological

model of ADHD from their perspective. Moreover, this requires parents' permission in order their child to participate for any research.

- Another outline is studying whether ADHD children can learn in a pure constructivist-learning environment rather than instructionist-learning environment. In other words, to determine whether a constructivist-pedagogy model could be used to help ADHD learners cope with their educational needs. This study will direct the future researcher to investigate to what extent the theory of constructivism is applicable for learners with Attention Deficit-Hyperactivity Disorder (See table 4-25: Link between Learning Criteria and ADHD).

- The aetiological model of ADHD, including the three levels of L1: Cognitive deficit, L2: Internal effects and L3: Observable signs, was developed and confirmed. However, the researcher has not detailed level 1 (cognitive deficit), which refers to the brain and the brain development, since it was not included in the scope of this study.

- While the aetiological model of ADHD is proved, it is also recommended that further study be carried out on the causes behind every individual symptom or observable impairments in order to expand the model as a causal model of ADHD as well as to approach to a more reliable model.

- It is also recommended that ADHD advantages can be studied in depth as well as investigation as to whether each individual limitation or impairment of ADHD can be changed to an advantage feature. The researcher also suggested investigating whether children with ADHD have gifts and whether these gifts can be controlled in order to obtain a higher number of advantages.

- Adoption of the 6Ms model for all children and the 7Ms model for ADHD in particular within the classroom.

- All stakeholders should reconsider the connotations of the term "disorder" so that it is seen also in terms of the advantages and not just limitations.

- Integration of constructivist approaches to learning in the classroom for children with ADHD (following the guidelines of the 6ms model).

- Use of multiple roles in communications between teachers and pupils with ADHD. This requires better appreciation of the different perspectives by all stakeholders.

References

- AAP, American Psychiatric Association. (1968) 'Diagnostic and statistical manual of mental disorders' (2nd ed.). Washington, DC: Author.
- AAP, American Psychiatric Association. (1994) 'Diagnostic and statistical manual of mental disorders' (4th ed.). Washington, DC: Author.
- AAP, American Academy of Pediatrics. (2004) 'ADHD: A complete and authoritative guide'. Elk Grove Village, I1: Author.
- Agda, M. F., Hamidi, F. and Ghorbandordinejad, F. (2011) 'The impact of constructivist and cognitive distance instructional design on the learners' creativity', Procedia computer science, Vol. 3 pp. 260-265.
- Akınoğlu, O. and Tandoğan, R. Ö. (2007) 'The effects of problem-based active learning in science education on students' academic achievement, attitude and concept learning. Eurasia Journal of mathematics, Science & technology education', Vol. 3 (1), pp. 71-81.
- Alexander, R. (1992) 'Still no pedagogy? Principle, Pragmatism and Compliance in primary education', Cambridge Journal of Education.
- Allen, R. and Hulme, C. (2006) 'Speech and language processing mechanisms in verbal serial recall. Journal of Memory and language', Vol. 55 (1), pp. 64-88.
- Allen, L. B., Tsao, J. C.I., Seidman, L. C., Ehrenreich-May, J. and Zeltzer, L. K. (2012) 'A unified, transdiagnostic treatment for adolescents with chronic pain and comorbid anxiety and depression. Cognitive and behavioral practice', Vol. 19 (1), pp. 56-67.
- Alty, J. L., Al-Sharrah, A. and Beacham, N. (2006) 'When humans form and media form humans: An experimental study examining the effects different digital media have on the learning outcomes of students who have different learning styles', Interacting with Computers, Vol. 18 (5), pp. 891-909.
- American Psychiatric Association. (1994) 'Diagnostic and statistical manual of mental disorders (4th ed.). Washington, DC: Author.
- Anderson, J. R. (1996) 'ACT: A simple theory of complex cognition', American Psychologist, Vol. 51 (4), pp. 355-365.
- Anderson, J. R. (1983) 'The architecture of cognition'. Cambridge: Harvard University Press.

- Anderson, A. and Algis, V. (2001) 'Small samples: Does size matter?', Investigative Ophthalmology and Visual Science, Vol. 42 (7), pp. 1411-1413.
- Antshel, K. M. (2010) 'ADHD, learning and academic performance in phenylketonuria', Molecular genetics and Metabolism, Vol. 99 pp. 552-558.
- Aoki, K. (2012) 'Generations of distance education: Technologies, pedagogies, and organizations', Procedia social and behavioural science, Vol. 55, pp. 1183-1187.
- Austin, K. A. (2009) 'Multimedia learning: Cognitive individual differences and display design techniques predict transfer learning with multimedia learning modules', Computers & Education. Vol. 53 (4), pp. 1339-1354.
- Baddeley, A. D. and Hitch, G. J. (1974) 'Working memory'. In Bower, G. (Ed.), *The Psychology of Learning and Motivation*, Academic Press, New York, Vol. 8 pp. 47–90.
- Baddeley, A. D. (1993) 'Working memory and conscious awareness', In: A. F. Collins, S.E. Gathercole, M. A. Conway and B. E. Morris (Eds). Theories of memory. Hove, UK: Lawrence Erlbaum Associates, pp. 11-28.
- Baddeley, A. D. (1999) 'Human memory', Boston, MA: Allyn & Bacon Publishing Company.
- Baddeley, A. (2002) 'Fractionating the central executive', In D. T. Stuss & R. T. Knight (Eds.), *Principles of frontal lobe function*, New York: Oxford University Press, pp. 246-260.
- Bakir, S. (2011) 'Is it possible to have students think creatively with the help of active learning techniques?', Procedia-Social and behavioral Sciences, Vol. 15 pp. 2533-2539.
- Barkley, R., Karlsson, J. and Pollard, S. (1985) 'Effects of age on the mother-child interactions of hyperactive children', Journal of Abnormal Psychology, Vol. 13 pp. 631-638.
- Barkley, R. A. and Edwards, G. H. (1997) 'Attention / deficit hyperactivity disorder (ADHD)', University of Massachusetts Medical Center. Academic Press.
- Barkley, R. A. (1997) 'Behavioral Inhibition, Sustained Attention, and Executive Functions: Constructing a Unifying Theory of ADHD', Psychology Bulletin, Vol. 121 No. 1 pp. 65-94.
- Barkley, R. A. and Gordon, M. (2002) 'Research on comorbidity, Adaptive

Functioning, and Cognitive Impairments in Adults with ADHD: Implications for a clinical practice. Clinician's guide to Adult ADHD, pp. 43-69.

- Barkley, R. A. (2003) 'Issues in the diagnosis of attention-deficit/hyperactivity disorder in children', Brain & development, Vol. 25 (2), pp. 77-83.
- Barkley, R. (2005) 'Taking charge of ADHD-the complete authoritative guide for parents'. New York: the Guilford Press.
- Barkley, R. (2006a) 'History. In: R. Barkley (Ed.) Attention deficit hyperactivity disorder: A handbook for diagnosis and treatment'. New York: Guilford Press.
- Barkley, R. (2006b) 'Associated cognitive, developmental, and health problems. In: R. Barkley (Ed.) Attention deficit hyperactivity disorder: A handbook for diagnosis and treatment', New York: Guilford Press.
- Barkley, R. (2006c) 'Etiologies. In: R. Barkley (Ed.). Attention deficit hyperactivity disorder: A handbook for diagnosis and treatment'. New York: Guilford Press.
- Beacham, N. A. and Alty, J. L. (2006) 'An investigation into the effects that digital media can have on the learning outcomes of individuals who have dyslexia', Computers & Education, Vol. 47, pp. 74-93.
- Bennett, N. (1988) 'The effective primary school teacher: The research for a theory of pedagogy', Teaching and Teacher Education, Vol. 4 No. 1 pp. 19-30.
- Becker, S., Luebbe, A. M., Stoppelbein, L., Greening, L. and Fite, P. J. (2012) 'Aggression among children with ADHD, anxiety, or co-occurring symptoms: comparing exacerbation and attenuation hypotheses', J Abnorm Child Psychol, Vol. 40 (4), pp. 527-542.
- Bioulac, S., Arfi, L. and Bouvard, M. P. (2008) 'Attention deficit/hyperactivity disorder and video games: A comparative study of hyperactive and control children', European psychiatry, Vol. 32 (2), pp. 134-141.
- Bioulac, S., Lallemand, S., Rizzo, A., Philip, P., Fabrigoule, C. and Bouvard, M. P. (2012) 'Impact of time on task on ADHD patient's performances in a virtual classroom', European Journal of Paediatric Neurology, Vol. 16 (5), pp. 514-521.
- Blatchford, P., Kutnick, P., Baines, E. and Galton, M. (2003) 'Towards a social pedagogy of classroom group work', International Journal of Educational Research, Vol. 39 (1-2), pp. 153-172.
- Biederman, J., Mick, E. and Faraone, S. (1998) 'Depression in attention deficit hyperactivity disorder (ADHD) children: "True" depression or demoralization?',

Journal of affective disorders, Vol. 47 (1-3), pp. 113-122.

- Bolliger, D. U. Supanakorn, S. and Boggs, Ch. (2010) 'Impact of podcasting on student motivation in the online learning environment', Computers & Education, Vol. 55 (2), pp. 714-722.
- Bogdan, R. C. and Biklen, S.K. (1982) 'Qualitative research for education: An introduction to theory and methods'. Boston: Allyn and Bacon, Inc.
- Bodemer, D., Ploetzner, R., Feuerlein, I. and Spada, H. (2004) 'The active integration of information during learning with dynamic and interactive visualisations', Learning and instruction, Vol. 14 (3), pp. 325-341.
- Brossard-Racine, M., Shevell, M., Snider, L., Bélanger, S. A. and Majnemer, A. (2012) 'Motor skills of children newly diagnosed with attention deficit hyperactivity disorder prior to and following treatment with stimulant medication', Research in developmental disabilities, Vol. 33 (6), pp. 2080-2087.
- Brassett-Harknett, A. and Bulter, N. (2007) 'Attention-deficit/hyperactivity disorder: An overview of the etiology and a review of the literature relating to the correlates and lifecourse outcomes for men and women', Clinical psychology review, Vol. 27 (2), pp. 188-210.
- Bratter, T. (2007) 'The myth of ADHD and the scandal of Ritalin: Helping John Dewey students succeed in medicine-free college preparatory and therapeutic high school', International Journal of Reality Therapy, Vol. 27 (1), pp. 4-13.
- Brackenridge, R., McKenize, K. Murray, G. C. and Guigley, A. (2011) 'An examination of the effects of stimulant medication on response inhibition: A comparison between children with and without attention deficit hyperactivity disorder', Research in developmental disabilities, vol. 32 (6), pp. 2797-2804.
- Brook, U. and Boaz, M. (2005) 'Attention deficit and hyperactivity disorder/learning disabilities (ADHD/LD): parental characterization and perception', Patient Education and counseling, Vol. 57 (1), pp. 96-100.
- Brooks, D. W. and Shell, D. F. (2006) 'Working memory, motivation, and teacher-initiated learning', Journal of science education and technology, Vol. 15 (1), pp. 17-30.
- Brosnan, J and Healy, O. (2011) 'A review of behavioral interventions for the treatment of aggression in individuals with developmental disabilities', Vol. 32 (2), pp. 437-446.
- Brown, Th. E. (2005) 'Attention deficit disorder: The Unfocused Mind in

children and Adults', New Haven, CT: Yale University Press.

- Brown, Th. E. (2008). Executive describing six aspects of a complex syndrome.
- Brown, T. E. (2009) 'Developmental complexities of attentional disorders'. In T. E. Brown (Ed.), ADHD Co-morbidities: Handbook for ADHD complications in children and adults. American Psychiatrics Publishing, Inc., Washington, D. C., pp. 3-22.
- Brinkman, W. B., Sherman, S. N., Zmitrovich, A. R., Visscher, M. O., Crosby, L. E., Phelan, K. J. & Donovan, E. F. (2012) 'In their own words: Adolescent views on ADHD and their evolving role managing medication', Academic pediatrics, Vol. 12 (1), pp. 53-61.
- Bryman, A. (2006) 'Integrating quantitative and qualitative research: How is it done?' Qualitative Research, Vol. 6, pp. 97-113.
- Bryman, A. and Bell, E. (2007) 'Business research methods', Second edition published in the United States by Oxford University Press Inc., New York.
- Bhaskar, R. A. (1975) 'A Realist Theory of Science', London: Verso.
- Buyukduman, İ., Şirin, S. (2010) 'Learning portfolio (LP) to enhance constructivism and student autonomy', Procedia-Social and Behavioral sciences, Vol. 3 pp. 55-61.
- Burgess, G. C., Depue, B. E., Ruzic, L., Willcutt, E. G., Du, Y. P. and Banich, M. T. (2010) 'Attentional control activation relates to working memory in attention-deficit/hyperactivity disorder', Biological psychiatry, Vol. 67 (7), pp. 632-640.
- Carson, E., Peterson, J. B. and Higgins, D. M. (2003) 'Decreased latent inhibition is associated with increased creative achievement in high-functioning individuals', Personality and individual differences, Vol. 85 (3), pp. 499-506.
- Carlotta, D., Borroni, S., Maffei, C. and Fossati, A. (2011) 'The role of impulsivity, sensation seeking and aggression in the relationship between childhood AD/HD symptom and antisocial behavior in adolescence', Neurology, Psychiatry and brain research, Vol. 17 (4), pp. 89-98.
- Chandler, P. and Sweller, J. (1991) 'Cognitive load theory and the format of instruction', Cognition and Instruction, Vol. 8 pp. 293-332.
- Chai, C. S., Koh, J. H. L., Tsai, C. and Tan, L. L. W. (2011) 'Modelling primary school pre-service teachers' technological pedagogical content knowledge

(TPACK) for meaningful learning with information and communication technology (ICT)', Computers & Education, Vol. 57 (1), pp. 1184-1193.

- Cheng, H. C., Chen, J. Y., Tsai, C. L., Shen, M. L. and C. R.J. (2011) 'Reading and writing performances of children 7-8 years of age with developmental coordination disorder in Taiwan', Research in developmental disabilities, Vol. 32 (6), pp. 2589-2594.
- Chen, C. and Sun, Y. (2012) 'Assessing the effects of different multimedia materials on emotions and learning performance for visual style learners', Computers & Education, Vol. 59 (4), pp. 1273-1285.
- Clarren, S. (2000) 'Attention deficit and hyperactivity disorder in the context of alcohol exposure in utero'. In: P. Accardo, T. Blondis, B. Whitman, and A. Stein (Eds.), Attention deficits and hyperactivity in children and adults. New York: Marcel Dekker.
- Clarke, A. R., Barry, R. J., McCarthy, R., Selikowitz, M., Brown, C. R. and Croft, R. J. (2003) 'Effects of stimulant medications on the EEG of children with attention-deficit/hyperactivity disorder predominantly inattentive type', International Journal of psychophysiology, Vol. 47 (2), pp. 129-137.
- Clair-Thompson, H. L. S. (2011) 'Executive functions and working memory behaviours in children with a poor working memory', Learning Individual Differences, Vol. 21(4), pp. 409-414.
- Clements, S. (1971) 'Nomenclature. In: L. Reginald (Ed.), Problem and issues in the education of exceptional children'. Boston, MA: Houghton Mifflin Company.
- Clerk, J. M. and Paivio, A. (1991) 'Dual load theory and education', Educational psychology review, Vol. 3 pp. 149-210.
- Cobb, P., Yackel, E. and Wood, T. (1992) 'A constructivist alternative to the representational view of mind in mathematics education', Journal for research in mathematics education, Vol. 23 (1), pp. 2-33.
- Cohen, L., Manion, L. and Morrison, K. (2003) 'Research Methods in Education', (Fifth edition).
- Coakes, S and Steed, L. (2007) 'SPSS: analysis without anguish version 14.0 for Windows, Milton: John Wiley and Sons Australia, Ltd.

- Colby, K. M. (1973) 'The rational for Computer-based Treatment of Language Difficulties in Nonspeaking Autistic Children', Journal of Autism and Childhood Schizophrenia, Vol. 3 (3), pp. 254-260.
- Colby, P. Sh. And Colby, R. (2008) 'A Pedagogy of Play: Integrating Computer Games into the Writing Classroom', Computers and Composition, Vol. 25 (3), pp. 300-312.
- Conole, G., Dyke, M., Oliver, M. and Seale, J. (2004) 'Mapping pedagogy and tools for effective learning design', Computers & Education, Vol. 43 (1-2), pp. 17-33.
- Conningham, C. and Barkley, R. (1979) 'The interactions of normal and hyperactive children with mothers during free play and structured task', Child Development, Vol. 50 (1), pp. 217-224.
- Cremin, T. C., Burnard, P. and Craft, A. (2006) 'Pedagogy and possibility thinking in the early years', Thinking Skills and Creativity, Vol. 1 (2), pp. 108-119.
- Creswell, J. (2008) 'Educational research: planning, conducting and evaluating quantitative and qualitative research', Third edition. Upper Saddle River, NJ: Pearson Prentiss Hall.
- Creswell, J. and Plano Clark, V. (2011) 'Designing and conducting mixed methods research', (2nd ed.). Thousand Oaks, CA: Sage.
- Cronbach, L. (1984) 'Essentials of psychological testing', (4th ed.). New York: Harper & Row.
- Ciuhan, G. C. and Vasile, A. S. (2010) 'Efficiency of experiential psychotherapy in the treatment of children with attention deficit hyperactivity disorder', Procedia-Social and Behavioral Sciences, Vol. 5 pp. 920-925.
- Cubillo, A., Halari, R., Smith, A., Taylor, E. and Rubia, K. (2012) 'A review of frono-strital and fronto-control brain abnormalities in children and adults with attention deficit hyperactivity disorder (ADHD)', Cortex, Vol. 48 (2), pp. 194-215.
- Daly, T. (2005) 'The ADHD solution for teachers: How to turn any disruptive child into your best student', Smarty Pants Publications.
- Davis, E. A. (2006) 'Characterizing productive reflection among preservice elementary teachers: Seeing what matters', Teacher and Teacher Education, Vol. 22 (3), pp. 281-301.

- Dewey, J. (1933) 'How we think: A restatement of the relation of reflective thinking to the educative process', Chicago: Henry Regenery and Co.
- Denzin, N. K. and Lincoln, Y. S. (2007) 'The Discipline and Practice of Qualitative Research'.
- Demeter, E., Hernandez-Garcia, L., Sarter, M. and Lustig, C. (2011) 'Challenges to attention: A continuous arterial spin labeling (ASL) study of the effects of distraction on sustained attention', Neurolmage, Vol. 54 (2), pp. 1518-1529.
- Donohue, W. and Noll, J. P. (1995) 'Is behaviorism false because there is no such thing as conditioning? Popper and Skinner on learning', New ideas in psychology, Vol. 13 (1), pp. 29-41.
- Dodonov, Y. and Dodonov, Y. A. (2011) 'Basic processes of cognitive development: missing component in Piaget's Theory', Procedia-Social and Behavioral sciences, Vol. 30 pp. 1345-1349.
- Donfrancesco, R., Miano, S., Martines, F., Ferrante, L., Melegari, M. G. and Masi, G. (2011) 'Bipolar disorder co-morbidity in children with attention deficit hyperactivity disorder', Psychiatry research, Vol. 186 (2-3), pp. 333-337.
- Dogan, Y. (2009) 'The analysis of the factors affecting the acquisition and usage of the contemporary in the social studies education: Teachers', Procedia, Social and Behavioral Sciences, Vol. 1 (1), pp. 1810-1819.
- DuPaul, G and Stoner, G. (1994) 'ADHD in the schools: Assessment and intervention strategies'. New York: The Guilford Press.
- Dutke, S. and Rinck, M. (2006) 'Multimedia learning: Working memory and the learning of word and picture diagrams', Learning and instruction, Vol. 16 (6), pp. 526-537.
- Eggen, P. D., and Kauchak, D. P. (2003) 'Teaching and learning: research-based methods', (Fourth edition). Allyn and Bacon.
- Eagle, S. (2012) 'Learning in the early years: Social interactions around picturebooks, puzzles and digital technologies', Computers & Education, Vol. 59 (1), pp. 38-49.
- Ellenbogen, M. A. and Schwartzman, A. E. (2009) 'Selective attention and avoidance on a pictorial cueing task during stress in clinically anxious and depressed participants', Behavioural research and therapy, Vol. 47 (2), pp. 128-138.
- Ertmer, P. and Ottenbreit-Leftwich, A. (2013) 'Removing obstacles to the

pedagogical changes required by Jonassen's vision of authentic technology-enhanced learning', Computers & Education, Vol. 64, pp. 175-182.

- Eiraldi, R. B., Mautone, J. A. and Power, T. J. (2012) 'Strategies for implementing evidence-based psychosocial interventions for children with attention-deficit/hyperactivity disorder', Child and Adolescent Psychiatric Clinics. Vol. 21 (1), pp. 145-159.
- Efstratopoulou, M., Janssen, R. and Simons, J. (2012) 'Differentiating children with attention-deficit/hyperactivity disorder, conduct, learning disabilities and autism spectrum disorders by means of their motor behavior characteristics', Research in developmental disabilities, Vol. 33, pp. 196-204.
- Fabio, R. A. and Antonietti, A. (2012) 'Effects of hypermedia instruction on declarative, conditional and procedural knowledge in ADHD students', Research in Developmental Disabilities, Vol. 33 (6), pp. 2028-2039.
- Flick, G. (1998) 'ADD/ADHD behavior-change resource kit', Jossey-Bass. San Francisco.
- Faraone, S. V. (2005) 'Molecular genetics of attention-deficit/hyperactivity disorder', Biological psychiatry, Vol. 57 (11), pp. 1313-1323.
- Faraone, S. V., Biederman, J., Doyle, A., Murray, K., Petty, C., Adamson, J. J. and Seidman, L. (2006) 'Neurosychological studies of late onset and subthreshold diagnoses of adult attention-deficit/hyperactivity disorder', Biological psychiatry, Vol. 60 (10), pp. 1081-1087.
- Faigel, H., Sznajderman, S., Tishby, O., Turel, M. and Pinus, U. (1995) 'Attention deficit disorder during adolescence: A review', Journal of Adolescent Health, Vol. 16 (3), pp. 174-184.
- Fassbender, E., Richards, D., Bilgin, A., Thompson, W, F. and Heiden, W. (2012) 'VirSchool: The effect of background music and Immersive display systems on memory for facts learned in an educational virtual environment', Computers & Education, Vol. 58 (1), pp. 490-500.
- Fava, L., Vicari, S., Valeri, G., D'Elia, L., Arima, S. and Strauss, K. (2012) 'Intensive behavioral intervention for school-aged children with autism', Research in Autism Disorders, Vol. 6 (4), pp. 1273-1288.
- Fernández-López, A., Rodríguez-Fórtiz, M. J., Rodríguez-Almendros, M. L. and Martínez-Segura, M. J. (2013) 'Mobile learning technology based on IOS devices to support special education needs', Computers & Education, Vol. 61,

pp. 77-90.

- Frazier, T. W., Frazier, A. R., Busch, R. M., Kerwood, M. A. and Demaree, H. A. (2008) 'Detection of simulated ADHD and reading disorder using symptom validity measures', Archives of clinical Neuropsychology, Vol. 23 (5), pp. 501-509.
- Freire, P. (1970) 'Pedagogy of the Oppressed', New York: Continuum.
- French, B. F., Zentall, S. S. and Bennett, D. (2003) 'Short-term memory of children with and without characteristics of attention deficit hyperactivity disorder', Learning and Individual Differences, Vol. 13 (3), pp. 205-225.
- Garcia, I. and Pacheco, C. L. (2010) 'Constructivism in Mexican elementary school education: Designing a platform for cooperative learning', Journal of software, Vol. 5, pp. 565-572.
- Garcia, C. R., Bau, C. H. D., Silva, K. L. Callegari-Jacques, S. M., Salgado, C. A. I., Fischer, A. G. Victor, M.M., Sousa, N.O., Karam, R. G., Rohde, L. A., Belmonte-de-Abreu, P. and Grevet, E. H. (2012) 'The burdened life of adults with ADHD: impairment beyond comorbidity', European psychiatry, Vol. 27 (5), pp. 309-313.
- Garcia, I and Pacheco, C. (2013) 'A constructivist computational platform to support mathematics education in elementary school', Computers & Education, Vol. 66, pp. 25-39.
- Gathercole, S. E., Lamont, E. and Alloway. T. P. (2006) 'Working memory in the classroom', Working memory and education, University Durham.
- Gathercole, S. and Baddeley, A. (1990) 'Phonological memory deficits in language diagnosed children: Is there a causal connection?', Journal of memory and language, Vol. 29 (3), pp. 336-360.
- Gau, S. S.F. and Chiang, H. L. (2013) 'Association between early attention-deficit/hyperactivity symptoms and current verbal and visuo-spatial short-term memory', Research in developmental disabilities, Vol. 34 (1), pp. 710-720.
- Genuchten, E. V., Scheiter, K. and Schüler, A. (2012) 'Examining learning from text and pictures for different task types: Does the multimedia effect differ for conceptual, causal, and procedural tasks?', Computers in human behavior, Vol. 28 (6), pp. 2209-2218.

- Girvan, C., Savage, T. (2010) 'Identifying an appropriate pedagogy for virtual worlds: A Communal Constructivism case study', Computers & Education, Vol. 55 (1) pp.342-359.
- Gill, J. and Johnson, P. (2005) 'Making methodological choices: the philosophical basis, Developing Business Knowledge', Sage Publications, London.
- Goldstein, S., and Goldstein, M. (1990) 'Managing attention disorders in children: A guide for practitioners'. New York, NY: Wiley Interscience Press.
- Goldstein, S. (2002) 'Continuity of ADHD in adulthood: Hypothesis and theory meet reality', Clinician's guide to adult ADHD: Assessment and intervention, pp. 25-42.
- Goldman, A. I. (1999) 'Knowledge in a social world', Oxford Press.
- Gore, J. M., Griffiths, T. and Ladwing, J. G. (2004) 'Towards better teaching: productive pedagogy as a framework for teacher education', Teaching and teacher Education, Vol. 20 (4), pp. 375-387.
- Green, C. and Chee, K. (1998) 'Understanding ADHD: The definitive guide to attention deficit hyperactivity disorder', New York: Fawcett Columbia.
- Groom, M. J., Jackson, G. M., Calton, T. G., Andrews, H. K., Bates, A. T., Liddle, P. F. and Hollis, L. C. (2008) 'Cognitive deficit in early-onset schizophrenia spectrum patients and their non-psychotic sibling: A comparison with ADHD', Schizophrenia research, Vol. 99(1-3), pp. 85-95.
- Groenewegen, S. Heinz, S. Frohlich, B. and Huckauf, A. (2008) 'Virtual world interfaces for special needs education based on props on a board', Computers & Graphics, Vol. 32 (5), pp. 589-596.
- Gross, M. and Voegeli, Ch. (2007) 'A multimedia framework for effective language training', Computers & Education, Vol. 31 (5), pp. 761-777.
- Gudjonsson, G. H. Sigurdsson, J. F., Einarsson, Emil., Bragason, O. O. and Newton, A. K. (2010) 'Inattention, hyperactivity/impulsivity and antisocial personality disorder. Which is the best predictor of false confessions?' Personality and individual Differences, Vol. 48 (6), pp. 720-724.
- Guey, Ch. Ch., Cheng, Y. Y. and Shibata, S. (2010) 'A triarchal instruction model; integration of principles from Behaviorism, Cognitivism, and Humanism', Procedia-Social and Behavioral Sciences, Vol. 9 PP. 105-118.
- Guerin, S., Buckley, S., McEvoy, J., Hillery, J. 7 Dodd, P (2009) 'The

psychometric properties of the attention-distraction, inhibition-excitation assessment scale (ADIECAS) in a sample of children with moderate and severe intellectual disabilities', Research in developmental disabilities, Vol. 30 (4), pp. 726-734.

- Gureasko-Moore, S., Dupaul, G. J. and White, G. P. (2006) 'The effects of self-management in general education classrooms on the organizational skills of adolescents with ADHD, Behav modif, Vol. 30 (2), pp. 159-183.
- Gut, J., Heckmann, C., Meyer, C. S., Schmid, M. and Grob, A. (2012) 'Language skills, mathematical thinking, and achievement motivation in children with ADHD, disruptive behavior disorder, and normal controls', Learning and individual Differences, Vol. 22 (3), pp. 375-379.
- Harris, L. D. and Wambeam, C. A. (1996) 'The internet-based composition classroom: A study in pedagogy', Computers and Composition, Vol. 13 (3), pp. 353-371.
- Hattie, J. and Timperley, H. (2007) 'The power of feedback', Review of educational research, Vol. 77 (1), pp. 81-112.
- Hale, G., and Lewis, M. (1979) 'Attention and cognitive development', New York: Plenum.
- Hale, T. S., McCracken, J. T., McGough, J. J., Smalley, S. L., Phillips, J. M. and Zaidel, E. (2005) 'Impaired linguistic processing and atypical brain laterality in adults with ADHD', Clinical neuroscience research, Vol. 5 (5-6), PP. 255-263.
- Harris, K. R., Reid, R. R. and Graham, S. (2004) 'Chapter 5- Self-regulation among students with LD and ADHD', Learning about learning disabilities (3rd edition), pp. 167-195.
- Harper, C. K., Chen, k. and Yen, D. C. (2004) 'Distance learning virtual classrooms and teaching pedagogy in the Internet environment', Technology in Society, Vol. 26 (4), pp. 585-598.
- Hermon-Jones, E., Barratt, E. S. and Wigg, C. (1997) 'Impulsiveness, aggression, reading, and the P300 of the event-related potential', Personality and Individual Differences, Vol. 22 (4), pp. 439-445.
- Hoogman, M., Onnink, M., Cools, R., Aarts, E., Kan, C., Vasquez, A.A., Buitelaar, J. and Franke, B. (2012) 'The dopamine transporter haplotype and reward-related striatal responses in adult ADHD', European Neuropsychopharmology, In press.

- Hinchliffe, G. (2001) 'Education or Pedagogy?', Journal of Philosophy of Education, Vol. 35 (1), pp. 31-45.
- Hoza, B. (2007) 'Peer functioning in children with ADHD', Ambulatory pediatrics, Vol. 7 (1), pp. 101-106.
- Hughes, L. and Cooper, P. (2007) 'Understanding and supporting children with ADHD', London, Paul Chapman Publishing.
- Huang, H., Lu, Ch., Tsai, H., Chao, Ch., Ho, T., Chuang, Sh., Tsai, Ch. and Yang, P. (2009) 'Effectiveness of behavioural parent therapy in preschool children with attention-deficit hyperactivity disorder', The Kaohsiung Journal of Medical Science. Vol. 25 (7), pp. 357-365.
- Huang, H., Rauch, U., and Liaw, Sh. Sh. (2010) 'Investigating learners' attitude toward virtual reality learning environments: Based on a constructivist approach', Computers & Education, Vol. 55 (3), pp. 1171-1182.
- Huber, M. T. (2010) 'Caring for students: Pedagogy and professionalism in an age of anxiety', Emotion, Space and society, Vol. 3 (2), pp. 71-79.
- Huitt, W. G., Monetti, D. M. and Hummel, H. (2009) 'Direct approach to instruction in C.M. Reigeluth and A.A. Carr-Chellman Eds', Instructional-design theories and models-building a common knowledge base, Vol. 3, Routledge: New Year.
- Hussu, A. S. and Strle, M. (2010) 'The assessment of children with special needs', procedia- Social behavioral science, Vol. 2 (2), pp. 5281-5284.
- Humphrey, N., Lendrum, A., Barlow, A., Wigelsworth, M. and Squires, G. (2013) 'Achievement for All: Improving psychosocial outcomes for students with special educational needs and disabilities', Research in Developmental Disabilities, Vol. 34 (4), pp. 1210-1225.
- Ingersoll, B. (1998) 'Daredevils and daydreamers: New perspectives on attention deficit/hyperactivity disorder', New York: Doubleday.
- Isaki, E. and Plante, E. (1997) 'Short-term memory and working memory differences in language/learning disabled and normal adults', Journal of communication disorders, Vol. 30 (6), pp. 427-437.
- Jamet, E., Gavota, M. and Quaireau, C. (2008) 'Attention guiding in multimedia learning', Learning and Instruction, Vol. 18 (2), pp. 135-145.
- Jimoyiannis, A. (2010) 'Designing and implementing an integrated technological pedagogical science knowledge framework for science teachers

professional development', Computers & Education, Vol. 55 (3), pp. 1259-1269.

- James, W. (2007). The principles of psychology. New York: Cosimo, Inc. Vol. 1
- Jonsdottir, S., Bouma, A., Sergeant, J. A. and Scherder, E. J. A. (2005) 'The impact of specific language impairment on working memory in children with ADHD combined subtype', Archives of Clinical Neuropsychology, Vol. 20 (4), pp. 443-456.
- Johnston, Ch., Mash, E. J., Miller, N. and Ninowski, J. E. (2012) 'Parenting in adults with attention-deficit/hyperactivity disorder (ADHD)', Clinical Psychology Review, Vol. 32 (4), pp. 215-228.
- Junod, R. E. V., DuPaul, J., Jitendra, A. K., Volpe, R. J. and Cleary, K. S. (2006) 'Classroom observations of students with and without ADHD: Differences across types of engagement,' Journal of School Psychology, Vol. 44 (2), pp. 87-104.
- Kaplan, B.J., Dewey, D.M., Crawford, S.G. and Wilson, B.N. (2001) 'The term comorbidity is of questionable value in reference to developmental disorders: Data and theory', Journal of Learning Disabilities, Vol. 34 (6), pp. 555-565.
- Kalyuga, S. (2012) 'Instructional benefits of spoken words: A review of cognitive load factors. Educational research review', Vol. 7 (2), pp. 145-159.
- Kagohara, D. M., Meer, L. V. D., Achmadi, D., Green, V. A., O'Reilly, M. F., Lancioni, G. E., Sutheriland, D. Lang, R., Marschik, P. B. and Sigafoos, J. (2012) 'Teaching picture naming to two adolescents with autism spectrum disorders using systematic instruction and speech-generating devices', Research in Autism Disorders, Vol. 6 (3), pp. 1224-1233.
- Kang, L., Brian, S. and Ricca, B. (2010) 'Constructivism in pharmacy teaching and learning', Current in pharmacy teaching, Vol. 2 (2), pp. 126-130.
- Keyser, M. W. (2000) 'Active learning and cooperative learning: understanding the difference and using both styles effectively', Research strategies, Vol. 17 (1), pp. 35-44.
- Keslair, F., Maurin, E. and McNally, S. (2012) 'Every child matters? An evaluation of "special educational needs" programmes in England', Economics of education review, Vol. 31 (6), pp. 932-948.
- Keiny, Sh. (1994) 'Constructivism and teachers' professional development', Teaching and teacher education, Vol. 10 (2), pp. 157-167.
- Khan, T. M. (2010) 'The effects of multimedia learning on children with

different special education needs', Procedia-Social and Behavioral Science, Vol. 2 (2), pp. 4341-4345.

- Khan, T. M. and Sajadi. S.S. (2012) 'Development of a pedagogy framework in social networked-based learning: supports for special educational needs', The international conference on E-learning in the workplaces 2012, pp. 1-7.
- Kiuru, N., Poikkeus, A. M., Lerkkanen, M. K., Pakarinen, E., Siekkinen, M., Ahonen, T. and Nurmi, J. E. (2012) 'Teacher-perceived supportive classroom climate protects against detrimental impact of reading disability risk on peer rejection', Learning and Instruction, Vol. 22 (5), pp. 331-339.
- Klingberg, T., Fernell, E., Olesen, P. J., Johnson, M., Gustafsson, P. and Dahlstrom, K. (2005) 'Computerized training of working memory in children with ADHD-A Randomized, Controlled trial', Journal of the American Academy of child & adolescent psychiatry, Vol. 44 (2), pp. 177-186.
- Klemes, J., Epstein, A., Zuker, M. Grinberg, N. and Ilovitch, T. (2006) 'An assistive computerized learning environment for distance learning students with learning disabilities', Open Learning: The Journal of Open, Distance and e-Learning. Vol. 21 (1), pp. 19-32.
- Kolb, D. A. (1984) 'Experiential learning: Experiences as the source of learning and development', Englewood Cliffs, NJ, USA: Prentice Hall.
- Kondracki, N. L., Wellman, N. S. and Amundson, D. R. (2002) 'Content Analysis: Review of Methods and Their Applications in Nutrition Education', Vol. 34 (4), pp. 224-230.
- Kovac, L., Garabedian, B., Souich, C. D. and Palmour, R. M. (2001) 'Attention deficit/hyperactivity in SLI children increases risk of speech/language disorders in first-degree relatives: A preliminary report', Journal of Communication Disorders, Vol. 34 (4), pp. 339-354.
- Kraker, M. (2000) 'Classroom discourse: teaching, learning, and learning disabilities', Teaching and Teacher Education, Vol. 16 (3), pp. 295-313.
- Krause, U. M., Stark, R. and Mandl, H. (2009) 'The effects of cooperative learning and feedback on e-learning in statistics,' Learning and Instruction, Vol. 19 (2), pp. 158-170.
- Lachman, J. L. M. (1972) 'Levels of comprehension in processing of normal and ambiguous sentences', Journal of verbal learning and verbal behavior, Vol. 11 (5), pp. 614-623.

- Langberg, J. M., Vaughn, A. J., Williamson, P., Epstein, J. N., Girio-Herrera, E. and Becker, S. P. (2011) 'Reinforcement of an organizational skills intervention for adolescents with ADHD for implementation by school mental health providers', School mental health, Vol. 3 pp. 143-155.
- Leach, J. and Moon, R. (1998) 'Learners and Pedagogy', (Eds.), London, Paul Chapman.
- Lee, A. A. (2006) 'How teaching influences learning: Implications for educational researchers, teachers, teacher educators and policy makers', Teaching and Teacher Education, Vol. 22 (5), pp. 612-625.
- Lee, S. S., Falk, A. E. and Aguirre, V. P. (2012) 'Association of comorbid anxiety with social functioning in school-age children with and without attention-deficit/hyperactivity disorder (ADHD)', Psychiatry research, Vol. 197 (1-2), pp. 90-96.
- Lee, P. C., Niew, W. I., Yang, H. J., Chen, V. C. C. and Lin, K. C. (2012) 'A meta-analysis of behavioral parent training for children with attention deficit hyperactivity disorder', Research in developmental disabilities, Vol. 33 (6), pp. 2040-2049.
- Lerner, J., Lowenstein, B., and Learner, S. (1995) 'Attention deficit disorders: Assessment and teaching', Pacific Grove, CA: Brooks/Cole.
- Lincoln, Y. and Guba, E. (1985) 'Naturalistic Inquiry', (Beverly Hills, Ca, Sage).
- Liaw, Sh. Sh. (2005) 'Developing a web assisted knowledge construction system based on the approach of constructivist knowledge analysis of tasks', Computers in human behavior, Vol. 21 (1), pp. 29-44.
- Lovio, R. Halttunen, A., Lyytinen, H., Naatanen, R. and Kujala, T. (2012) 'Reading skill and neural processing accuracy improvement after a 3-hour intervention in preschoolers with difficulties in reading-related skills', Brain research, Vol. 1448 (11), pp. 42-55.
- Loe, I. M. and Feldman, H. M. (2007) 'Academic and educational outcomes of children with ADHD', Ambulatory pediatrics, Vol. 7 (1), pp. 82-90.
- Loh, P. R., Piek, J. P. and Barrett, N. C. (2011) 'Comorbid ADHD and DCD: Examining cognitive function using the WISC-IV', Research in developmental disabilities, Vol. 32 (4), pp. 1260-1269.
- Locascio, G., Mahone, E. M., Eason, S. H. and Cutting, S. H. (2010) 'Executive

dysfunction among children with reading comprehension deficits', Journal of learning disability, Vol. 43 (5), pp. 441-454.

- Luman, M. Meel, C. S. V., Oosterlaan, J., Sergeant, J. A. and Geurts, H. M. (2009) 'Does reward frequency or magnitude drive reinforcement-learning in attention-deficit/hyperactivity disorder?', Psychiatry research, Vol. 168 (3), pp. 222-229.
- Lunenberg, M. and Samaras, A. (2011) 'Developing a pedagogy for teaching self-study research: Lessons learned across the Atlantic', *Teaching and Teacher Education*, Vol. 27 (5), pp. 841-850.
- MacFarlane, K. and Woolfson, L. M. (2013) 'Teacher attitudes and behavior toward the inclusion of children with social, emotional and behavioral difficulties in mainstream schools: An application of the theory of planned behavior', Teaching and teacher education, Vol. 29, pp. 46-52.
- Magnan, A. and Ecalle, J. (2006) 'Audio-Visual training in children with reading disabilities', Computers & Education, Vol. 46 (4), pp. 407-425.
- Marcus, G. F. (1998) 'Can connectionism save constructivism?', Cognition, Vol. 66 (2), pp. 153-182.
- MacPhail, A., Tannehill, D. and Karp, G. G. (2013) 'Preparing physical education perspective teachers to design instructionally aligned lesson through constructivist pedagogical practices', Teaching and teacher education, Vol. 33, pp. 100-112.
- Marshall, C. and Rossman, G. B. (1999) 'Designing qualitative research', Sage publication. USA.
- Martin, A. J. (2012) 'The role of personal best (PB) goals in the achievement and behavioural engagement of students with ADHD and students without ADHD', Contemporary Educational Psychology, Vol. 37 (2), pp. 91-105.
- Martín-del-Campo, B., García, L. R., Lorca, M. M., Mínguez, G. D.L.H. and Díaz-Perea, M. D. R. (2010) 'When the old is stronger than the new: Introduction of constructivist methodology in a special education needs', Linguistics and Education, Vol. 21 (3), pp. 143-170.
- Matsuura, N., Hashimoto, T. and Toichi, M. (2010) 'The characteristics of AD/HD symptoms, self-esteem, and aggression among serious juvenile delinquents offenders in Japan', Research in Developmental Disabilities, Vol. 31 (6), pp. 884-890.

- Mayer, R. E. (2001) ‘Multimedia learning’, Cambridge University Press, United Kingdom.
- Mayer, R. E. and Moreno, R. (2002) ‘Aids to computer-based multimedia learning’, Learning and instruction, Vol. 12 (1), pp. 107-119.
- Mayer, R. (2004) ‘Should there be a three-strikes rule against pure discovery learning? The case for guided methods of instruction’, American Psychologist, Vol. 59 (1), pp. 14-19.
- Merrill, M. D. (2002) ‘First principles of instruction’, Educational Technology Research and Development, Vol. 50, pp. 43-59.
- Mehta, R. and Sivadas, E. (1995) ‘Comparing response rates and response content in mail versus electronic surveys’, Journal of Market research Society, Vol. 37 (4), pp. 429-440.
- Mccormick, R. and Scrimshaw. P. (2001) ‘Information and Communications Technology’, Knowledge and Pedagogy. Education, Communication and Information, Vol. 1 (1), pp. 37-57.
- McKee, L., Colletti, C., Rakow, A., Jones, D. J. and Forehand, R. (2008) ‘Parenting and child externalizing behavior: Are the associations specific or diffuse?’, Aggression and violent Behavior’, Vol. 13 (3), pp. 201-215.
- Merriam, Sh. B. (2002) ‘Introduction to Qualitative research’.
- Miles, M. B., Huberman, A. M., (1994) ‘Qualitative Data Analysis: An expanded sourcebook’, Second edition, Sage: London & Thousand Oaks, California.
- Muijs, D (2011) ‘Doing quantitative research in education with SPSS’, Second edition. SAGE Publication Ltd.
- Mourik, R. V., Oosterlaan, J., Heslenfeld, D. J., Konig, C. E. and Sergeant, J. A. (2007) ‘When distraction is not distracting: A behavioral and ERP study on distraction in ADHD’, Clinical Neurophysiology, Vol. 118 (8), pp. 1855-1865.
- Moghadam, H. (1988) ‘Attention deficit disorder: Hyperactivity revisited’, Calgary, Alberta, Canada: Detselig Enterprises, Ltd.
- Moloi, F., Morobe, N. and Urwick, J. (2008) ‘Free but inaccessible primary education: A critique of the pedagogy of English and mathematics in Lesotho’, International journal of educational development, Vol. 28 (5), pp. 612-621.
- Moreno, R. and Mayer, R. E. (1999) ‘A coherence effect in multimedia learning: the case minimizing irrelevant sounds in the design of multimedia messages’,

Journal of Educational Psychology, Vol. 92 (1), pp. 117-125.

- Moreno, L., Gonzalez, C., Castilla, I., Gonzalez. E. and Sigut, J. (2007) 'Applying a constructivist and collaborative methodological approach in engineering education', Computers & Education, Vol. 49 (3), pp. 891-915.
- Murphy, P. and Wolfenden, F. (2013) 'Developing a pedagogy of mutuality in a capability approach: Teachers' experiences of using the Open Educational Resources (OER) of the teacher education in sub-Saharan Africa (TESSA) programme', International Journal of Educational Development, Vol. 33, pp. 263-271.
- Myers, M. D. (2009) 'Qualitative Research in Business & Management'. Sage, London.
- Nash, R. (2003) 'Progress at school: pedagogy and the care for knowledge', Teaching and Teacher Education, Vol. 19 (7), pp. 755-767.
- Nash, T. and Norwich, B. (2010) 'The initial training of teachers to teach with special educational needs: A national survey of English Post Certificate of Educational programs', Teaching and Teacher Education, Vol. 26 (7), pp. 1471-1480.
- Nicolson, R. I., Pickering, S. and Fawcett, A. J. (1991) 'Computers & Education, Vol. 16, (2), pp. 203-209.
- Nie, Y. and Lau, Sh. (2010) 'Differential relations of constructivist and didactic instruction to students' cognition, motivation, and achievement', Learning and Instruction, Vol. 20 (5), pp. 411-423.
- Ohan, J. L., Visser, T. A. W., Strain, M. C. and Allen, L. (2011) 'Teachers' and education students' perceptions of and reactions to children with and without the diagnosed label "ADHD"', Journal of school psychology, Vol. 49 (1), pp. 81-105.
- Ojose, B. (2008) 'Applying Piaget's Theory of cognitive development to mathematics instruction', The mathematics educator, Vol. 18 (1), pp. 26-30.
- Ozkal, K., Tekkaya, C., Cakiroglu, J. and Sungur, S. (2009) 'A conceptual model of relationships among constructivist learning environment perceptions, epistemological beliefs, and learning approaches', Learning and individual differences, Vol. 19 (1), pp. 71-79.
- Park, S., Cho, S. Ch., Hong, Y. Ch., Oh, S. Y., Kim, J. W., Shin, m. s., Kim, B. N., Yoo, H. J., Cho, I, H. and Bhang, S. Y. (2012) 'Association between dietary

behavior and attention-deficit/hyperactivity disorder and learning disabilities in school-aged children', Psychiatry research, Vol. 198 (3), pp. 468-476.

- Parmentier, F. B. R. (2008) 'Towards a cognitive model of distraction by auditory novelty: The role of involuntary attention capture and semantic processing', Cognition, Vol. 109 (3), pp. 345-362.
- Papert, S. (1975) 'Teaching children thinking', Journal of structural learning, Vol. 5 (3-5), pp. 353-365.
- Patterson, G. R. (1982) 'A social learning approach to family intervention: III', Coercive family process. Eugene, OR: Castalia.
- Payne, A. M., Stephenson, J. E., Morris, W. B., Tempest, A. M. and Griffin, D. K. (2009) 'The use of an elearning constructivist solution in workplace learning', International Journal of Industrial Ergonomics. Vol. 39 (3), pp. 548-553.
- Paivio, A. and Lambert, W. (1981) 'Dual coding and bilingual memory', Journal of verbal learning and verbal behavior, Vol. 20 (5), pp. 532-539.
- Paivio, A. (1986) 'Mental representations: A dual coding approach', Oxford University Press.
- Paivio, A. (1991) 'Dual coding theory: retrospect and current status', Canadian Journal of Psychology/Revue Canadian de psychologies, Vol. 45 (3), pp. 255-287.
- Pajo, B. and Stuart, P. H. (2012) 'A comparative review of "how to" books for parents of ADHD children and "how to" books for parents of typical children', Children and youth services review, Vol. 34 (4), pp. 826-833.
- Pelham, W., Greenslade, K., Vodde-Hamilton, M., Murphy, D., Greenstein, J., Gnagy, E., Guthrie, K., Hoover, M. and Dahl, R. (1990) 'Relative efficacy of long acting stimulants on children with attention deficit-hyperactivity disorder: A comparison of standard methylphenidate, sustained release methylphenidate, sustained release dextroamphetamine, and pemoline', *Pediatrics*, Vol. 86 (2), pp. 226-237.
- Petty, N. J., Thomson, O. P. and Stew, G. (2012) 'Ready for a paradigm shift?', Part 2: introducing qualitative research methodologies and methods. Vol. 17(5), pp. 378-384.
- Piaget, J. (1954) 'Intelligence and affectivity: their relationship during child development', Palo Alto, CA: Annual Review, Inc.

- Posner, N. and Synder, C. (1975) ‘Attention and cognitive control. In: R. Solso (Ed.), Information processing and cognition: The Loyola Symposium’. Hillsdale, NJ: Earlbaum Press.
- Ponde, M. P., Cruz-Freire, A. C. and Silveira, A. A. (2012) ‘Relationship between learning problems and attention deficit in childhood’, Journal of attention disorders, Vol. 16 (6), pp. 505-509.
- Pring, R. (2004) ‘Philosophy of Educational Research’, Second edition: Continuum.
- Quinlan, D. M. and Brown, T. E. (2003) ‘Assessment of short-term verbal memory impairments in adolescents and adults with ADHD’, Journal of attention disorders, Vol. 6 (4), pp. 143-152.
- Rabipour, Sh. and Raz, A. (2012) ‘Training the brain: Fact and fad in cognitive and behavioral remediation’, Brain and Cognition, Vol. 79 (2), pp. 159-179.
- Rapport, M. D., Timko, Th. M. and Wolfe, R. (2006) ‘Attention-deficit/hyperactivity disorder’, Clinicians’ Handbook of child behavioral assessment, pp. 401-435.
- Ramdoss, S., Mulloy, A., Lang, R., O’Reilly, M., Sigafoos, J., Lancioni, G., Didden, R. and Zein, F. E. (2011) ‘Use of computer-based interventions to improve literacy skills in students with autism spectrum disorders: A systematic review’, Research in Autism Spectrum Disorders, Vol. 5 (4), pp. 1306-1318.
- Rayner, Ch., Denholm, C. and Sigafoos, J. (2009) ‘Video-based intervention for individuals with autism: Key questions that remain unanswered’, Research in Autism Spectrum Disorders, Vol. 3 (2), pp. 291-303.
- Rasanen, P., Salminen, J. Wilson, A. J., Aunio, P. and Dehaene, S. (2009) ‘Computer-assisted intervention for children with low numeracy skills’, Cognitive Development, Vol. 24 (4), pp. 450-472.
- Reed, F. D. D., Hyman, S. R. and Hirst, J. M. (2011) ‘Applications of technology to teach social skills to children with autism’, Research in Autism Spectrum Disorders, Vol. 5 (3), pp. 1003-1010.
- Regtvoort, A. G. F. M. and Leij, A. V. D. (2007) ‘Early intervention with children of dyslexic parents: Effects of computer-based reading instruction at home on literacy acquisition’, Learning and Individual Differences, Vol. 17 (1), pp. 35-53.

- Remenyi, D. Money, B. and Swartz, E. (1998) 'Doing research in business and management: an introduction to process and methods', Sage publications, London.
- Reynolds, D. H. (2000) 'What does the teacher do? : Constructivist pedagogies and prospective teachers' beliefs about the role of a teacher', Teaching and Teacher Education, Vol. 16 (1), pp. 21-32.
- Reynolds, D. H. (2000) 'What does the teacher do? : Constructivist pedagogies and prospective teachers' belief about the role of a teacher', Teaching and teacher education, Vol. 16 (1), pp. 21-32.
- Richard, M. (2000) 'Dispelling the myths and misconceptions about ADHD. In: B. Guyer (Ed.), ADHD: Achieving success in school and life'. Boston: Allyn and Bacon.
- Rich, B. A., Schmajuk, M., Perez-Edgar, K. E., Pine, D. S., Fox, N. A. and Leibenluft, E. (2005) 'The impact of reward, punishment, and frustration on attention in pediatric bipolar disorder. Biological psychiatry, Vol. 58 (7), pp. 532-539.
- Reilly, C. J. (2011) 'Attention deficit hyperactivity disorder (ADHD) in childhood epilepsy', Research in developmental disabilities, Vol. 32(3), pp. 883-893.
- Rovai, A. P. (2004) 'A constructivist approach to online college learning', The Internet and higher education, Vol. 7 (2), pp. 79-93.
- Rogers, M. A. Wiener, J., Marton, I. and Tannock, R. (2009) 'Parental involvement in children's learning: Comparing parents of children with and without attention-deficit/hyperactivity disorder (ADHD)', Journal of school psychology, Vol. 47(3), pp. 167-185.
- Robson, C. (2011) 'Real world research', (third edition). Chichester: Wiley.
- Rossman, G. B. and Wilson, B. L (1984) 'Numbers and words: Combining quantitative and qualitative methods in a single large scale evaluation study', Evaluation review, Vol. 9 (5), pp. 627-643.
- Rossman, G. B. and Wilson, B. L (1991) 'Numbers and word revisited: Being "Shamelessly eclectic" , Evaluation review, Vol. 9 (5), pp. 627-643.
- Rosen, S. (2003) 'Auditory processing in dyslexia and specific language impairment: is there a deficit? What is its nature? Does it explain anything?' Journal of phonetics, Vol. 31 (3-4), pp. 509-527.

- Rosen, S., Cohen, M. and Vanniasegaram, I. (2010) 'Auditory and cognitive abilities of children suspected of auditory processing disorder (APD)', International Journal of Pediatric Otorhinolaryngology, Vol. 74 (6), pp. 594-600.
- Rosenblum, S., Aloni, T. and Josman, N. (2010) 'Relationships between handwriting performance and organizational abilities among children with and without dysgraphia: A preliminary study', Research in developmental disabilities, Vol. 31 (2), pp. 502-509.
- Rutherford, P. (2008) 'Instruction for all students', Alexandria, VA: Just ASK Publications & Professional development.
- Ryan, G. W. and Bernard, H. R., (2003) 'Techniques to identify themes', Field Methods 15 (1), 85-109.
- Ryan, R. M. and Deci, E. L. (2000) 'Self-determination theory and the facilitation of intrinsic motivation, Social development, and well-being', American Psychologist, Vol. 55 (1), pp. 68-78.
- Saunders, M., Lewis, P. and Thornhill, A. (2003) 'Research methods for business students', third edition, Prentice Hall.
- Saunders, M., Thornhill, A. and Lewis, P. (2009) 'Research Methods for Business Students', Financial Times/Prentice Hall.
- Saneei, A., Bahrami, H. and Haghegh, S. A. (2010) 'Self-esteem and anxiety in human figure drawing of Iranian children with ADHD', The arts in psychotherapy, Vol. 38 (4), pp. 256-260.
- Sawicka, A. (2008) 'Dynamic of cognitive load theory: A model-based approach', Computers in Human Behavior, Vol. 24 (3), pp. 1041-1066.
- Sage, K. and Baldwin, D. (2010) 'Social gating and pedagogy; Mechanisms for learning and implications for robotics', Neural Networks, Vol. 32 (8-9), pp. 1091-1098.
- Sajadi, S. S. and Khan, T. M. (2011) 'An evaluation of constructivism for learners with ADHD: Development of a constructivist pedagogy for special needs', European, Mediterranean & Middle Eastern Conference on Information Systems 2011, pp. 656-671.
- Sarter, M., Givens, B. and Bruno, (2001) 'The cognitive neuroscience of sustained attention: where top-down meets bottom-up', Brain research reviews, Vol. 35 (2), pp. 146-160.
- Seufert, T., Schütze, M. and Brünken, R. (2009) 'Memory characteristics and

modality in multimedia learning: An aptitude-treatment-interaction study', Learning and Instruction, Vol.19 (1), pp. 28-42.

- Stevenson, L. (2008) 'Tool, tutor, environment or resource: Exploring metaphors for digital technology and pedagogy using activity theory', Computers & Education, Vol. 51 (2), pp. 836-853.
- Stern, P. and Shalev, L. (2013) 'The role of sustained attention and display medium in reading comprehension among adolescents with ADHD and without it', Research in developmental disabilities, Vol. 34 (1), pp. 431-439.
- Strauss, A. and Corbin, J. (1992) 'Grounded theory methodology', An overview.
- Simon, B. (1997). Why no pedagogy in England? Abridged version. In J. Leach and R. Moon (Eds.), Learners and pedagogy. London: Paul Chapman in association with The Open University.
- Sivakumar, T., Agarwal, V. and Sitholey, P. (2013) 'Comorbidity of attention-deficit/hyperactivity disorder and bipolar disorder in North Indian clinic children and adolescents', Asian Journal of Psychiatry, Vol. 6 (3), pp. 235-242.
- Schuler, A., Scheiter, K., Rummer, R. and Gerjets, P. (2012) 'Explaining the modality effect in multimedia learning: Is it due to a lack of temporal contiguity with written text and pictures?', Learning and Instruction, Vol. 22 (2), pp. 92-102.
- Schwean, V., Parkinson, M., Francis, G. and Lee, F. (1993) 'Educating the ADHD child: Debunking the myths', Canadian Journal of school psychology, Vol. 9 (1), pp. 37-52.
- Schaefer, R. and Dillman, D. A. (1998) 'Development of standard email methodology: results of an experiment', Public Opinion Quarterly, Vol. 62 (3), pp. 338-397.
- Schery, T. and O'Connor, L. (1997) 'Language intervention: Computer training for young children with special needs', British Journal of Educational Technology. Vol. 28 (4), pp. 271-279.
- Schonlau, M., Fricker, R. Elliot, M, (2001) 'Conducting research surveys via e-mail and the web', Rand Corporation Santa Monica, CA.
- Schuldt, B. and Totten, J. (1999). "Email surveys: what we've learned thus far".
- Schunk, D. H. and Zimmerman, B. J. (1994) 'Self-regulation of learning and performance: Issues and educational applications', Hillsdale, NJ: Lawrence Erlbaum.

- Sesen, B., Tarhan, L. (2010) 'Promoting active learning in high school chemistry: learning achievement and attitude', Social and behavioral science, Vol. 2 (2), pp.2625-2630
- Shallice, K. L. and Burgess, P. W. (1991) 'Deficits in strategy application following frontal lobe damage in man', Brain, Vol. 114 (2), pp. 727-741.
- Shim, S. E., Hwangbo, Y., Kwon, Y. J., Jeong, H. Y., Lee, B. H., Lee, H. J. and Kim, Y. K. (2012) 'Increased levels of plasma brain-derived neurotrophic factor (BDNF) in children with attention deficit-hyperactivity disorder (ADHD)', Progress in Neuro-Psychopharmchology and Biological Psychiatry, Vol. 32 (8), pp. 1824-1828.
- Shimoni, M., Engel-Yeger, B. and Tirosh, E. (2012) 'Executive dysfunctions among boys with attention deficit hyperactivity disorder (ADHD): Performance-based test and parents report', Research in developmental disabilities, Vol. 33 (3), pp. 858-865.
- Sheih, R. S. (2012) 'The impact of technology-enhanced active learning (TEAL) implementation on student learning and teachers' teaching in a high school context', Computers & Education, Vol. 59 (2), pp. 206-214.
- Seo, Y. J. and Woo, H. (2010) 'The identification, implementation, and evaluation of critical user interface design features of computer-assisted instruction programs in mathematics for students with learning disabilities', Computers & Education, Vol. 55 (1), pp.363-377.
- Siklos, S. and Kerns, K. (2004) 'Assessing multitasking in children with ADHD using a modified Six Elements Test', Archive of clinical neuropsychology, Vol. 19 (3), pp. 347-361.
- Soe, Y. J. and Bryant, D. P. (2009) 'Analysis of studies of the effects of computer-assisted instruction on the mathematics performance of students with learning disabilities', Computers & Educations, Vol. 53 (3), pp. 913-928.
- Stelt, O. V. D., Molen, M. V. D., Gunning, W. B. and Kok, A. (2001) 'Neuroelectrical signs of selective attention to color in boys with attention-deficit hyperactivity disorder', Cognitive brain research, Vol. 12 (2), pp. 245-264.
- Stuss, D. T. and Knight, R. T. (2013) 'Principles of frontal lob function', pp. 246-260. New York: Oxford University Press.
- Sweller, J. (1988) 'Cognitive load during problem solving: Effects on learning',

Cognitive science, Vol. 12 (2), pp. 257-285.

- Sweller, J. (1994) 'Cognitive load theory, learning difficulty, and instructional design', Learning and Instruction, Vol. 4 (4), pp. 295-312.
- Sweller, J. (2011) 'Cognitive load theory', Psychology of learning and motivation, Vol. 55 pp. 37-76.
- Sung, E., Mayer, R. (2012) 'Affective impact of navigational and signalling aids to e-learning', Computers in human behavior, Vol. 28 (2), pp. 473-483.
- Tannock, R. (1998) 'Attention deficit hyperactivity disorder: Advances in cognitive, neurobiological, and genetic research', J Child Psychol Psychiatry, Vol. 39 (1), pp. 65-99.
- Tannock, R. (2004) 'Language and mental health disorders: the case of ADHD'.
- Tan, T. Sh. and Cheung, W. S. (2008) 'Effects of computer collaborative group work on peer acceptance of a junior pupil with attention deficit hyperactivity disorder (ADHD)', Computers & Education, Vol. 50 (3), pp. 725-741.
- Takeda, T., Ambrosini, P. J., deBerardinis, R. and Elia, J. (2012) 'What can ADHD without comorbidity teach us about comorbidity?', Research in developmental disabilities, Vol. 33 (2), pp. 419-425.
- Tashakkori, A. and Teddlie, C. (2003) 'Handbook of Mixed Methods in Social and Behavioral Research', Sage publications.
- Tschang, F. T. and Szczypula, J. (2006) 'Idea creation, constructivism and evolution as key characteristics in the videogame artifact design process', European management journal, Vol. 24 (4), pp. 270-287.
- Thorn, A. S. C., Gathercole, S. E. and Feankish. C. (2005) 'Redintegration and benefits of long-term knowledge in verbal short-term memory: An evaluation of Schweickert's (1993) multinomial processing tree model', Cognitive psychology, Vol. 50 (2), pp. 133-158.
- Tenenbaum, G., Naidu, S., Jegede, O and Austin, J. (2001) 'Constructivist pedagogy in conventional on campus and distance learning practice: an exploratory investigation. Learning and Instruction, Vol. 11 (2), pp. 87-111.
- Thompson, C. S. (2006) 'Powerful pedagogy: Learning from and about teaching in an elementary literacy course', Teaching and Teacher Education, Vol. 22 (2), pp. 194-204.
- Toplak, M. E., Dockstader, C. and Tannock, R. (2006) 'Temporal information processing in ADHD: Findings to date and new methods', Journal of

Neuroscience methods, Vol. 151 (1), pp. 15-29.

- Tirri, K. (2011) 'Holistic school pedagogy and values: Finnish teachers' and students' perspectives', International journal of educational research, Vol. 50 (3), pp. 159-165.
- Tsai, F. J., Chiang, H. L., Lee, C. M., Gau, S. F., Lee, W. T., Fan, P. C., Wu, Y. Y. and Chiu, Y. N. (2012) 'Sleep problems in children with autism, attention-deficit hyperactivity disorder, and epilepsy', Research in autism spectrum disorder, Vol. 6 (1), pp. 413-421.
- Turner, K. T. and Sanders, M. R. (2006) 'Help when it's needed first: A controlled evaluation of brief, preventive behavioral family intervention in a primary care setting', Behavior therapy, vol. 37 (2), pp. 131-142.
- Tynjälä, P. (1999) 'Towards expert knowledge? A comparison between a constructivist and traditional learning environment in the university', International Journal of educational research, Vol. 31 (5), pp. 357-442.
- Tymms, P. and Merrell, C. (2011) 'ADHD and academic attainment: Is there an advantage in impulsivity', Learning and individual differences, Vol. 21 (6), pp. 753-758.
- Uekermann, J., Kraemer, M., Abdel-Hamid, M., Schimmelmann, B.G., Hebebrand, J., Duam, I., Witfand, J. & Kis, B. (2010) 'Social cognition in attention-deficit hyperactivity disorder (ADHD)', Neuroscience and Biobehavioral Review, Vol. 34 (5), pp. 734-743.
- Vandewalle, E., Boets, B., Boons, T., Ghesquière, P. and Zink, I. (2012) 'Oral language and narrative skills in children with specific language impairment with and without literacy delay: A three-year longitudinal study', Research in developmental disabilities, Vol. 33 (6), pp. 1857-1870.
- Vera, L., Campos, R., Herrera, G. and Romero, C. (2007) 'Computer graphics applications in the education process of people with learning difficulties', Computers & Graphics, Vol. 31 (4), pp. 649-658.
- Vloet, T., Konard, K., Herpertz-Dahlmann, B., Polier, G. and Günther, T. (2010) 'Impacts of anxiety disorders on attentional functions in children with ADHD', Journal of Affective Disorders, Vol. 124 (3), pp. 283-290.
- Vygotsky, L. S (1978) 'Mind in society: The development of higher psychological processes', Cambridge, MA: Harvard University Press.

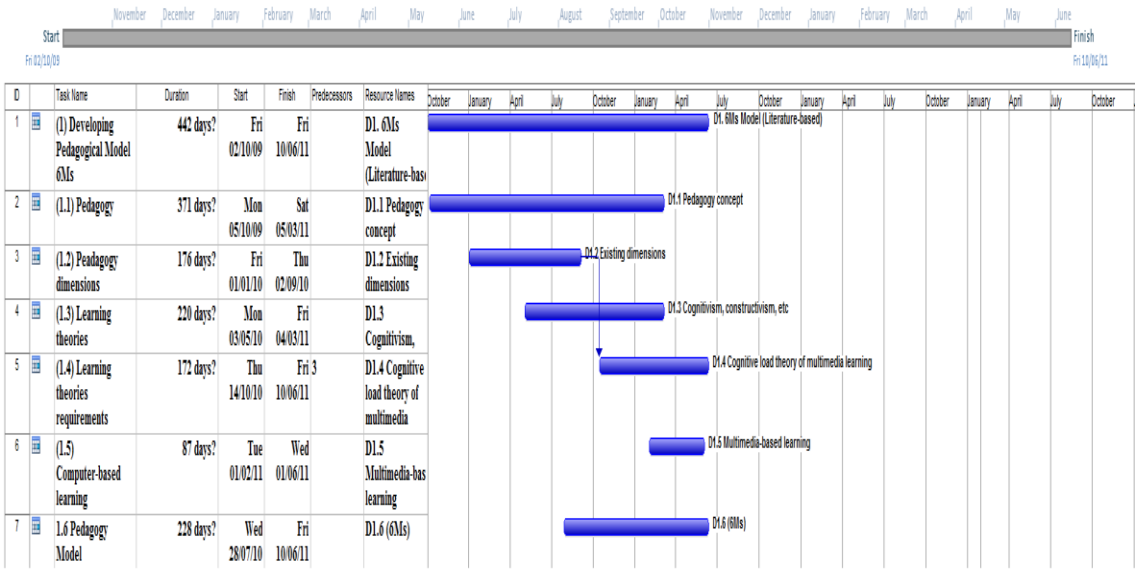
- Wang, L.C., Tsai, H. J. and Yang, H. M. (2013) 'The effect of different stimulus attributes on the attentional performance of children with attention deficit/hyperactivity disorder and dyslexia', Research in Developmental Disabilities, Vol. 34 (11), pp. 3936-3945.
- Weiss, G., and Hechtman, L. (1993) 'Hyperactive children grown up', New York: Guilford press.
- Wainer, A. L. and Ingersoll, B. R. (2011) 'The use of innovative computer technology for teaching social communication to individuals with autism spectrum disorders', Research in Autism Spectrum Disorders, Vol. 5 (1), pp. 96-107.
- Watkins, D. E. and Wentzel, K. R. (2008) 'Training boys with ADHD to work collaboratively: Social and learning outcomes', Contemporary Educational Psychology, Vol. 33 (4), pp. 625-646.
- Wehmeier, P. M., Schacht, A. and Barkley, R. A. (2010) 'Social and emotional impairment in children and adolescents with ADHD and the impact on quality of life', Journal of Adolescent health, Vol. 46 (3), pp. 209-217.
- Welsch, K. K., Jenlink, R. M. (1998) 'Challenging assumptions about teaching and learning: Three case studies in constructivist pedagogy', Teaching and Teacher Education, Vol. 14 (4), pp. 413-427.
- White, H. and Shah, P. (2006) 'Uninhibited imaginations: Creativity in adults with Attention-Deficit/Hyperactivity Disorder', Personality and individual differences, Vol. 40 (6), pp. 1121-1131.
- White, H. and Shah, P. (2011) 'Creative style and achievement in adults with Attention-Deficit/Hyperactivity Disorder', Personality and individual differences, Vol. 50 (5), pp. 673-677.
- Wodka, E. L., Loftis, Ch., Mostofsky, S. H., Prahme, C., Larson, J. C. G., Denckla, M. B. and Mahone, E. M. (2008) 'Prediction of ADHD in boys and girls using the D-KEFS', Archives of clinical neuropsychology, Vol. 23 (3), pp. 283-293.
- Willcutt, E. C., Betjemann, R. S., McGrath, L. M., Chhabildas, N. A., Olson, R. K., DeFries, J. C. and Pennington, B. F. (2010) 'Etiology and neuropsychology of comorbidity between RD and ADHD: the case for multiple-deficit models', Cortex, Vol. 46 (10), pp. 1345-1361.
- Winstantley, C. A. Eagle, D. M. and Robbins, T. W. (2006) 'Behavioral models

of impulsivity in relation to ADHD: Translation between clinical and preclinical studies', Clinical psychology review, Vol. 26 (4), pp. 379-395.

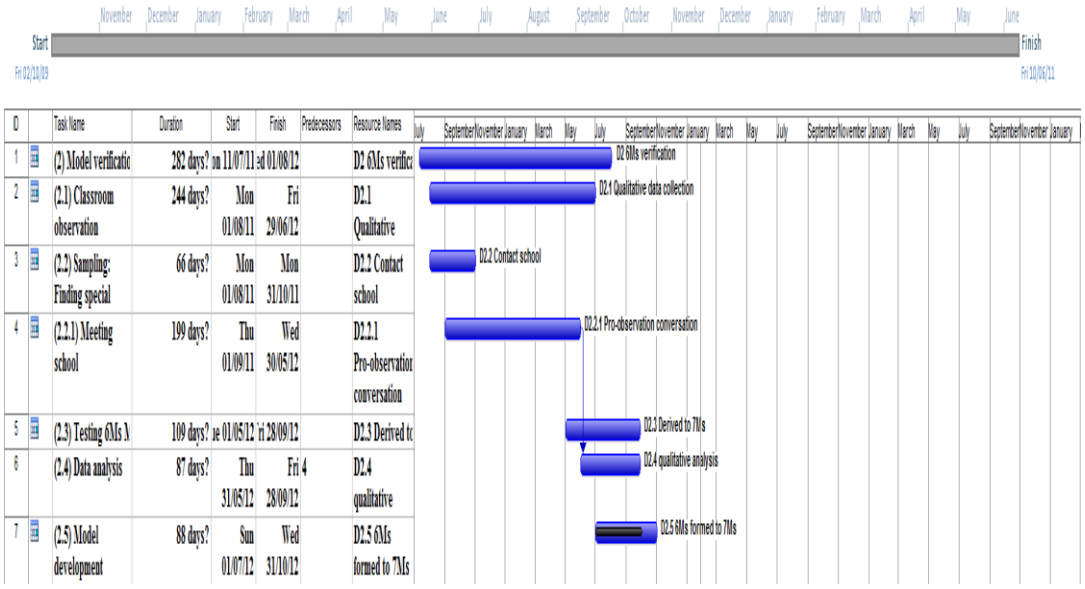
- Wong, A., Wayne, L., Marcus, N. and Sweller, J. (2012) 'Cognitive load theory, the transient information effect and e-learning', Learning and instruction, Vol. 22 (6), pp. 449-457.
- Woo, Y. and Reeves, T. C. (2007) 'Meaningful interaction in web-based learning: A social constructivist interpretation', The Internet and higher education, Vol. 10 (1), pp. 15-25.
- Young, R. A. and Collin, A. (2004) 'Introduction: Constructivism and social constructionism in the career field', Journal of Vocational Behavior, Vol. 64 (3), pp. 373-388.
- Yin, R., (2009) 'Case Study Research: Design and Methods', Sage Publications, Inc.
- Zhenlin, W. (2009) 'To teach or not to teach: Controversy surrounding constructivism in early childhood education', Hong Kong Journal of Early Childhood, Vol. 8 (1), pp. 56-65.
- Zhang, Y. and Wildemuth, B. M. (2009) 'Qualitative Analysis of content'.

Appendix (A): Research plan

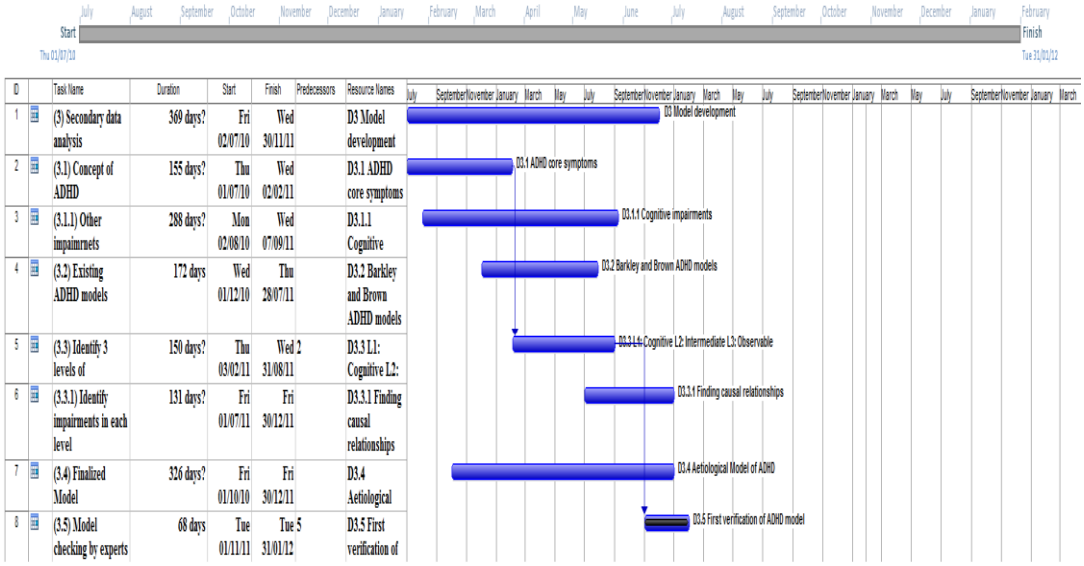
Research plan (I): Pedagogy model (*6Ms*)



Research plan (II): Observation of *6Ms* /Model verification

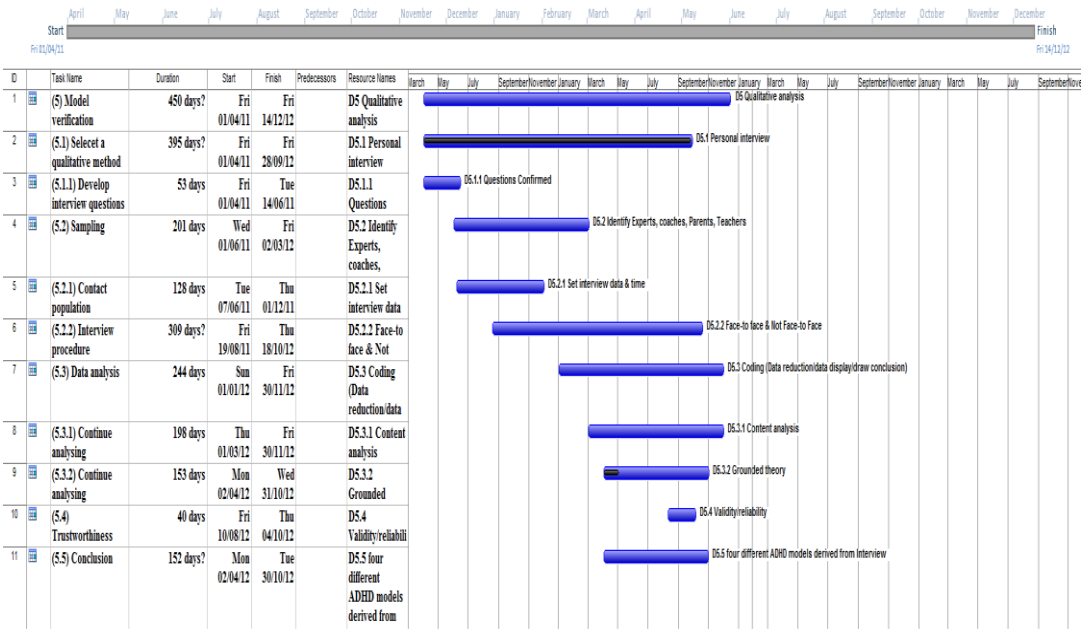


Research plan (III): Aetiological model of ADHD



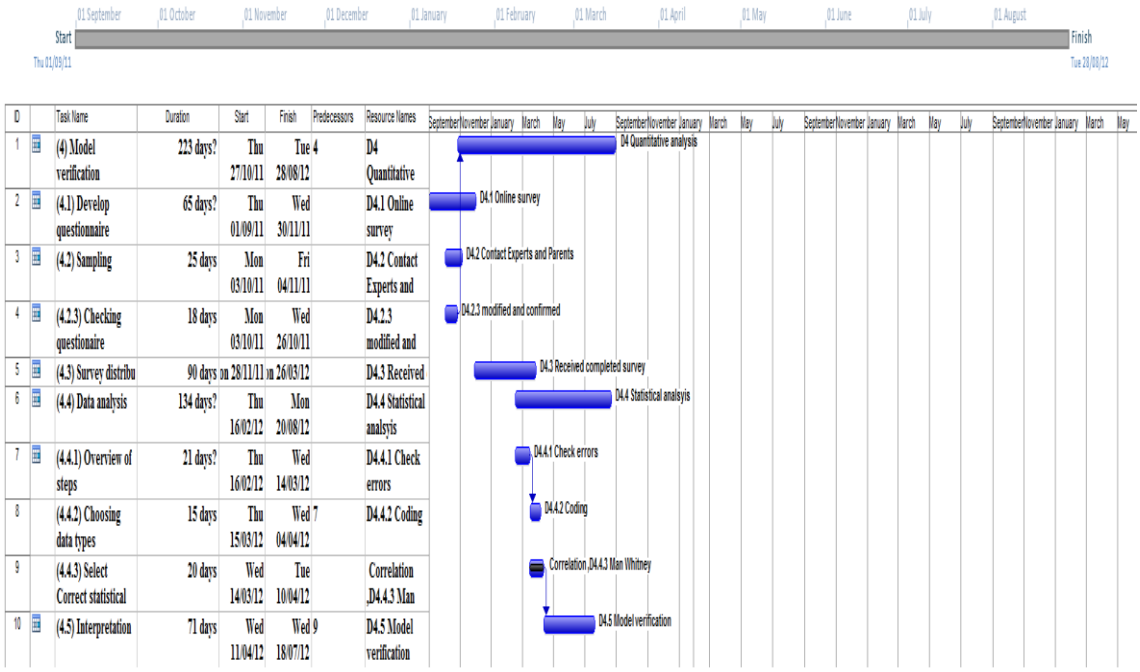
ID	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1	(3) Secondary data analysis	369 days?	Fri 02/07/10	Wed 30/11/11		D3 Model development
2	(3.1) Concept of ADHD	155 days?	Thu 01/07/10	Wed 02/02/11		D3.1 ADHD core symptoms
3	(3.1.1) Other impairmnets	288 days?	Mon 02/08/10	Wed 07/09/11		D3.1.1 Cognitive
4	(3.2) Existing ADHD models	172 days	Wed 01/12/10	Thu 28/07/11		D3.2 Barkley and Brown ADHD models
5	(3.3) Identify 3 levels of	150 days?	Thu 03/02/11	Wed 2 31/08/11		D3.3 L1: Cognitive L2:
6	(3.3.1) Identify impairments in each level	131 days?	Fri 01/07/11	Fri 30/12/11		D3.3.1 Finding causal relationships
7	(3.4) Finalized Model	326 days?	Fri 01/10/10	Fri 30/12/11		D3.4 Aetiological
8	(3.5) Model checking by experts	68 days	Tue 01/11/11	Tue 5 31/01/12		D3.5 First verification of

Research plan (IV): Model verification through Interview (Aetiological model of ADHD)



ID	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1	(5) Model verification	450 days?	Fri 01/04/11	Fri 14/12/12		D5 Qualitative analysis
2	(5.1) Selecet a qualitative method	395 days?	Fri 01/04/11	Fri 28/09/12		D5.1 Personal interview
3	(5.1.1) Develop interview questions	53 days	Fri 01/04/11	Tue 14/06/11		D5.1.1 Questions
4	(5.2) Sampling	201 days	Wed 01/06/11	Fri 02/03/12		D5.2 Identify Experts, coaches,
5	(5.2.1) Contact population	128 days	Tue 07/06/11	Thu 01/12/11		D5.2.1 Set interview data
6	(5.2.2) Interview procedure	309 days?	Fri 19/08/11	Thu 18/10/12		D5.2.2 Face-to face & Not
7	(5.3) Data analysis	244 days	Sun 01/01/12	Fri 30/11/12		D5.3 Coding (Data reduction/data
8	(5.3.1) Continue analysing	198 days	Thu 01/03/12	Fri 30/11/12		D5.3.1 Content analysis
9	(5.3.2) Continue analysing	153 days	Mon 02/04/12	Wed 31/10/12		D5.3.2 Grounded
10	(5.4) Trustworthiness	40 days	Fri 10/08/12	Thu 04/10/12		D5.4 Validity/reliabili
11	(5.5) Conclusion	152 days?	Mon 02/04/12	Tue 30/10/12		D5.5 four different ADHD models derived from

Research plan (V): Model verification through questionnaire (Aetiological model of ADHD)



Source: Developed for the purpose of this study

Appendix (B): Interview questions

Expert interview

Q1. Please tell me what does ADHD mean from your point of view?

Q2. Tell me about your experience with ADHD children or adults

Q3. Do you have direct involvement with ADHD children or adults?

Q4. Tell me what is your role as an expert?

Q5. Can you explain how a child with ADHD might behave?

Q6. Can you describe the main challenges of being ADHD?

Q7. Do you think being ADHD would be problematic for them at school?

Q8. What types of learning difficulties they might have?

Q9. Can you explain what are the attention challenges that ADHD might have?

Q10. What is the reason behind attention difficulties?

Q11. Do they have social problems?

Q12. Is there any solution to help them overcome with social difficulties?

Q13. Do they have difficulties in organizing or planning?

Q14. Is there any solution to help them manage their work?

Q15. Do they have difficulties in following instruction?

Q16. What kind of tasks or activities they are interested to engage?

Q17. Can you describe what are the important issues about ADHD?

Q18. What kind of teaching strategies you would recommend?

Q19. Is there anything you would like to add or discuss that I have not covered?

ADHD coach interview

Q1. What is attention-deficit/hyperactivity disorder from your perspective?

Q2. Can you please tell me about your experience with ADHD children?

Q3. Can you please tell me how important is ADHD?

Q4. Please explain how child with ADHD might behave?

Q5. What are the main challenges of ADHD?

Q6. What are the impacts of inattentiveness?

Q7. Do they have poor working memory?

Q8. What are the impacts of poor working memory?

Q9. What are the behavioural impairments that ADHD might engage with?

Q10. Does ADHD have positive sides?

Parent interview

Q1. What does ADHD mean to you and what is your understanding about being ADHD?

Q2. Please tell me about your child and his / her strengths?

Q3. How did you recognize that your child had diagnosed with ADHD?

Q4. Does s/he diagnosed with other disorders / disabilities?

Q5. What are the main challenges that you have with your child?

Q6. Please tell me about your child at school

Q7. Does your child have learning difficulties?

Q8. What types of learning challenges does s/he have that cannot cope with?

Q9. Is s/he visual or verbal learner?

Q10. How s/he can cope with technology (e.g. computer, ipad, mobile, etc.)?

Q11. What types of educational environment you would recommend?

Q12. Is there anything you would like to add or comment on?

Teacher interview

Q1. Can you please tell me about your position at school?

Q2. Please explain how a child with ADHD might behave?

Q3. What are the main challenges of ADHD in the classroom?

Q4. Please tell me about observable learning difficulties that ADHD might have?

Q5. What kind of teaching methods you apply in your classroom to teach ADHD children?

Q6. Do you use specific delivery learning materials (e.g. internet, multimedia, social network)

Q7. Are they visual or verbal learner?

Q8. How you order and sequence the learning materials (e.g. difficult to easy)

Q9. What method you apply to manage and control learning (e.g. instructor-led, socially-led, peer-led, or self-determined)

Q10. What strategy you follow to evaluate your pupil?

Q11. Is there anything you would like to share?

Appendix (C): Classroom observation sheets

Timeline table:

Activity	Timeline (Minutes)	Description
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Educational Goals:

Activity	Educational goals	Perspective (*7Ms*)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Pedagogy schema (*6Ms*):

Stage 1

DIMENSION	SELECTION
Model of learning	
Mode of Engagement	
Method of Facilitation	
Medium of Delivery	
Manner of Feedback	
Map of Content	

Stage 2

DIMENSION	SELECTION
Model of learning	
Mode of Engagement	
Method of Facilitation	
Medium of Delivery	
Manner of Feedback	
Map of Content	

Stage 3

DIMENSION	SELECTION
Model of learning	
Mode of Engagement	
Method of Facilitation	
Medium of Delivery	
Manner of Feedback	
Map of Content	

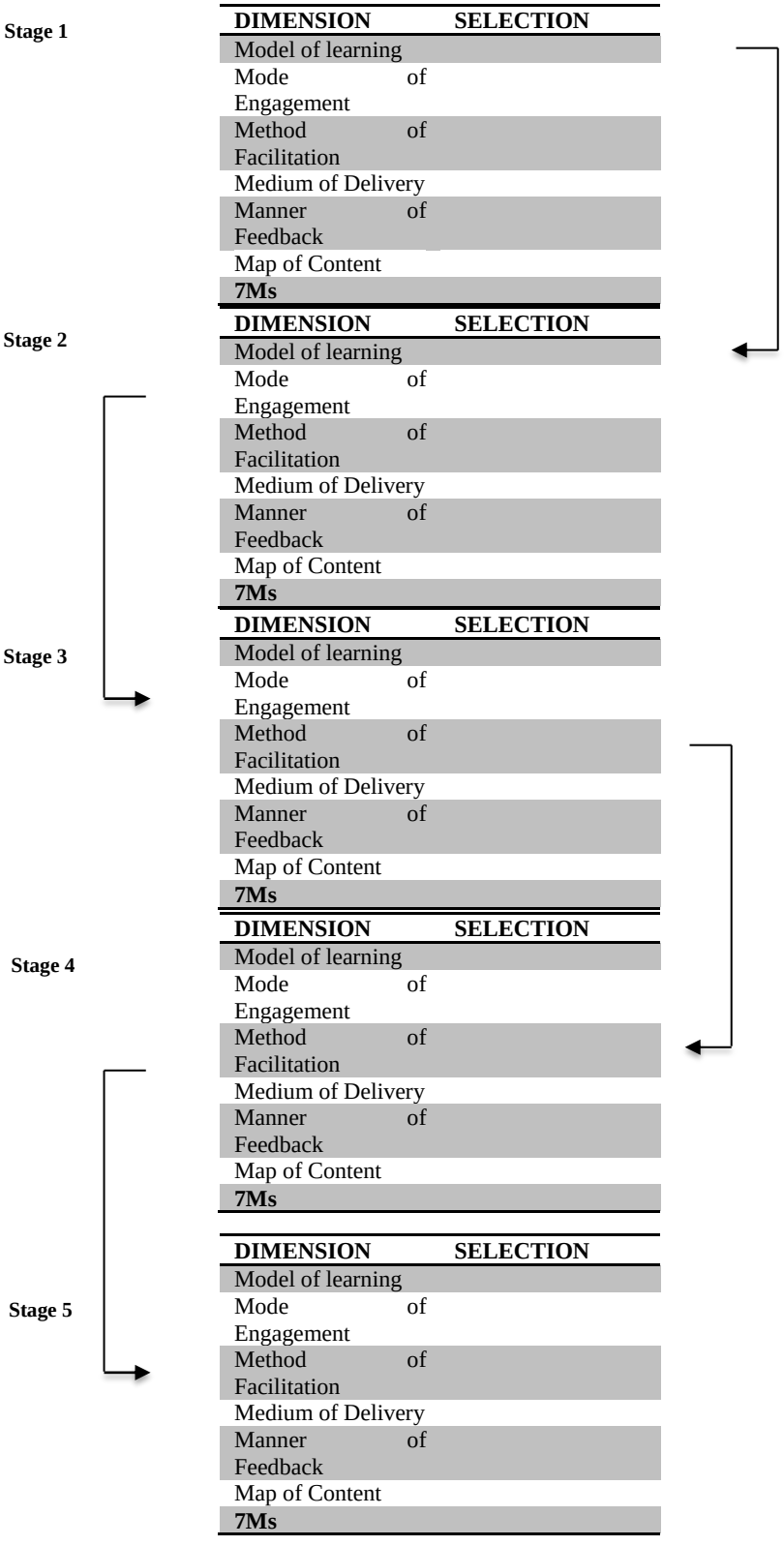
Stage 4

DIMENSION	SELECTION
Model of learning	
Mode of Engagement	
Method of Facilitation	
Medium of Delivery	
Manner of Feedback	
Map of Content	

Stage 5

DIMENSION	SELECTION
Model of learning	
Mode of Engagement	
Method of Facilitation	
Medium of Delivery	
Manner of Feedback	
Map of Content	

Pedagogy schema (*7Ms*): *(Mind set of perspectives)*



Appendix (D): Online survey

Attention Deficit Disorder

Dear AD/HD coaches, support groups, Specialists,

We are currently evaluating ADHD impairments and strengths in order to present an educational behavioral model for ADHD. Your direct experiences and opinions are valuable, and your input will significantly direct the research towards finding suitable teaching pedagogy for ADHD children / adults.
I understand that any information obtained as a result of your participation in this research will be keeping as confidential as legally possible. In any publications that results from this research, no names will be identified.
Enclosed is a questionnaire which has covered 3 different section: Personal information, ADHD impairments, and ADHD benefits. We appreciate all the information that you can provide for us. We recognise the important role you play in ADHD education and development. If you have additional queries or concerns, please do not hesitate to contact details below.

Thank you
Brunel University London,
Uxbridge
Middlesex, UB8 3PH

Samira Sajadi
Email: samirasadat.sajadi@brunel.ac.uk
Contact No. (+44)01895267781

Attention Deficit Disorder

Section 1: Personal Information

Please indicate your status

- [ ] ADHD support group / Charity
- [ ] Specialist / Researcher
- [ ] Psychologist / Psychiatrist
- [ ] Parent / Carer
- [ ] Teacher / ADHD coach

Other (please specify)

Do you have direct involvement with ADHD children or adults?

- ◯ Yes
- ◯ No

Please indicate your level of experience of AD/HD diagnosis

- ◯ Beginner
- ◯ Knowledgeable
- ◯ Expert

Other (please specify)

Attention Deficit Disorder

Section 2: ADHD Impairments

On the basis of your direct experience, please indicate your level of agreement on the following statements regarding the difficulties experienced by learners with ADHD:
Scale from Strongly agree to Strongly disagree

◯ Strongly agree ◯ Agree ◯ Neutral ◯ Disagree ◯ Strongly disagree

ATTENTION

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Often fails to give close attention to details or makes careless mistakes in schoolwork or other activities	◯	◯	◯	◯	◯
Often has difficulty sustaining attention in tasks or activities	◯	◯	◯	◯	◯
Often does not seem to listen when spoken to directly	◯	◯	◯	◯	◯
Often easily distracted by extraneous stimuli	◯	◯	◯	◯	◯
Often has difficulty organizing tasks or activities	◯	◯	◯	◯	◯
Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort such as schoolwork or homework)	◯	◯	◯	◯	◯
Often loses things necessary for tasks or activities (e.g. toys, school assignments, pencils, books, or tools)	◯	◯	◯	◯	◯

EMOTION

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Has poor self-regulation of emotion	◯	◯	◯	◯	◯
Has greater problem with frustration, tolerance, and anxiety	◯	◯	◯	◯	◯
Often deliberately dose things that annoy other people	◯	◯	◯	◯	◯
Often loses temper	◯	◯	◯	◯	◯

SPEECH & AUDITORY PROBLEM

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Has auditory processing disorder (i.e. Verbal processing)	◯	◯	◯	◯	◯
Has speech impairments	◯	◯	◯	◯	◯
Engages in excessive conversational speech (i.e. Talk too much)	◯	◯	◯	◯	◯
Poor organization and inefficient expression of ideas	◯	◯	◯	◯	◯
Impaired verbal problem-solving	◯	◯	◯	◯	◯

WORKING MEMORY

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Has poor verbal/non-verbal working memory	◯	◯	◯	◯	◯
Often has difficulty in holding information in their mind	◯	◯	◯	◯	◯
Often has difficulty in recalling information	◯	◯	◯	◯	◯

Attention Deficit Disorder

IMPULSIVITY

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Often blurts out answers before the questions have been completed	◯	◯	◯	◯	◯
Has often difficulty awaiting turn	◯	◯	◯	◯	◯
Often interrupts or intrudes on others (i.e. butts into conversations or games)	◯	◯	◯	◯	◯
Has often feelings of restlessness	◯	◯	◯	◯	◯

ORGANIZATIONAL SKILLS

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Often loses things necessary for tasks or activities (i.e. toys, school assignments, pencils, books, or tools)	◯	◯	◯	◯	◯
Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (i.e. schoolwork or homework	◯	◯	◯	◯	◯
Has often difficulty organizing tasks and activities	◯	◯	◯	◯	◯
Has poor planning	◯	◯	◯	◯	◯

KNOWLEDGE INTEGRATION

	Strongly agree	Agree	Neutral	Disgree	Strongly disagree
Does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace	◯	◯	◯	◯	◯
Has Impaired ability making connections and integration between verbal and visual information	◯	◯	◯	◯	◯
Often fails to understand instructions	◯	◯	◯	◯	◯
Often responds with irrelevant information	◯	◯	◯	◯	◯
Has difficulties recalling information from clues and hints	◯	◯	◯	◯	◯

Are there any other ADHD impairments and cause behind them you would like to add?

◯ Yes

◯ No

Other (please specify)

Attention Deficit Disorder

Causal relationships

On the basis of your direct experience, please indicate your level of agreement on the following statements regarding the reasons behind the difficulties experienced by learners with ADHD: Scale from Highly likely to Not relevant

	Highly likely	Likely	Neutral	Unlikely	Not relevant
Combination of speech & auditory difficulties, poor attention, and poor working memory leads to poor knowledge integration	◯	◯	◯	◯	◯
Poor knowledge integration may leads to communication problem	◯	◯	◯	◯	◯
Combination of auditory & speech difficulties, poor attention, and poor working memory leads to language problem	◯	◯	◯	◯	◯
Poor working memory causes slow information processing	◯	◯	◯	◯	◯
Slow information processing leads to attention deficit	◯	◯	◯	◯	◯
Language problem causes poor reading/writing	◯	◯	◯	◯	◯
Language problem causes difficulty in following instruction	◯	◯	◯	◯	◯
Combination of language problem and anxiety cause communication problem	◯	◯	◯	◯	◯
Poor organizational skills causes poor reading/writing	◯	◯	◯	◯	◯
Poor organizational skills causes difficulty in following instruction	◯	◯	◯	◯	◯
Poor attention leads to distraction	◯	◯	◯	◯	◯
Distraction leads to lack of focus and attention deficit	◯	◯	◯	◯	◯
Emotion problem leads to anxiety and impulsivity	◯	◯	◯	◯	◯
Anxiety may causes lack of focus and attention deficit	◯	◯	◯	◯	◯
Anxiety may causes restlessness and lack of focus	◯	◯	◯	◯	◯
Impulsivity may causes difficulty in waiting for task and restlessness	◯	◯	◯	◯	◯

Attention Deficit Disorder

Section 3: ADHD strengths

On the basis of your direct experience, please indicate your level of agreement on the following statements regarding the strength experienced by learners with ADHD: Scale from Strongly agree to Strongly disagree

	Strongly agree	Agree	Neutral	Disgree	Strongly disagree
Ability to hyperfocus and have full engagement on a task/activity they interested in	◯	◯	◯	◯	◯
Ability to process visual information and have heightened spatial reasoning	◯	◯	◯	◯	◯
Ability to understand and communicate with visual stimuli	◯	◯	◯	◯	◯
Ability to process information at a hyper speed on a task/activity they interested in	◯	◯	◯	◯	◯
Ability to process multiple tasks of interest simultaneously	◯	◯	◯	◯	◯
Ability to generate original and unconventional ideas and to be creative	◯	◯	◯	◯	◯
Ability to interact with surroundings and to offer uninhibited responses (e.g. blurt out answers)	◯	◯	◯	◯	◯

Please specify any other special abilities you have observed in ADHD learners

On the basis of your direct experience, please indicate your level of agreement on the following statements: Scale from Strongly agree to Strongly disagree

	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Reasoning with visual and verbal information allows ADHD learners to process multiple tasks simultaneously	◯	◯	◯	◯	◯
Integration of visual and verbal information can create unconventional thinking in ADHD learners	◯	◯	◯	◯	◯
Separation of visual and verbal information can evoke productive-impulsive participation	◯	◯	◯	◯	◯
A rapid-fire mind could produce creativity among ADHD	◯	◯	◯	◯	◯
A rapid-fire mind could lead to productive-impulsive interaction	◯	◯	◯	◯	◯
A rapid-fire mind could convey the impression of multi-tasking	◯	◯	◯	◯	◯
Hours of engagement on an interesting concept may cause creativity among ADHD learners	◯	◯	◯	◯	◯
Hours of engagement on an interesting concept could enable multi-tasking capabilities among ADHD learners	◯	◯	◯	◯	◯
Hours of engagement on an interesting concept could encourage the blurting out of answers	◯	◯	◯	◯	◯

Attention Deficit Disorder

On the basis of your direct experience, please indicate your level of agreement on the following statements: Scale from Strongly agree to Strongly disagree

	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Ability to process multiple tasks simultaneously enables handling of increased amounts of visual information	◯	◯	◯	◯	◯
Ability to process multiple tasks simultaneously encourages greater levels of participation and interaction	◯	◯	◯	◯	◯
Ability to think unconventionaly and creatively enables abstract processing of visual information	◯	◯	◯	◯	◯
Ability to think unconventionaly and creatively encourages more productive and increased levels of participation and interaction	◯	◯	◯	◯	◯
A tendency to productive-impulsive participation enables faster processing of visual information	◯	◯	◯	◯	◯
A tendency to productive-impulsive participation encourages increased levels of participation and interaction	◯	◯	◯	◯	◯

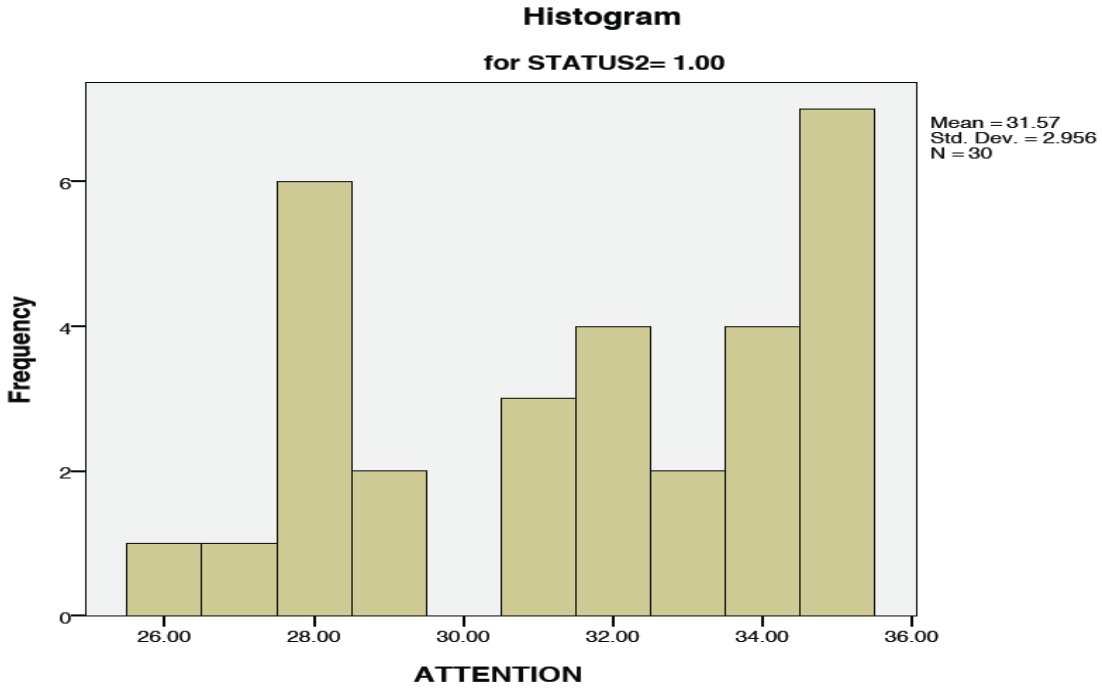
Please specify any other abilities you have observed in ADHD learners, and suggest possible reasons for them.

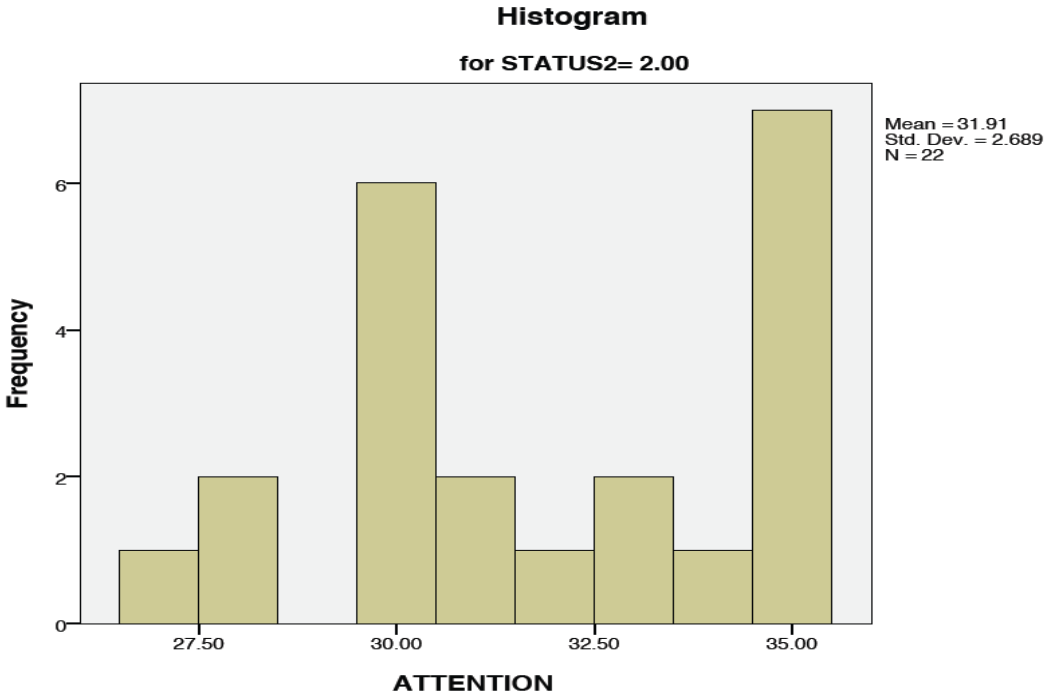
Attention Deficit Disorder

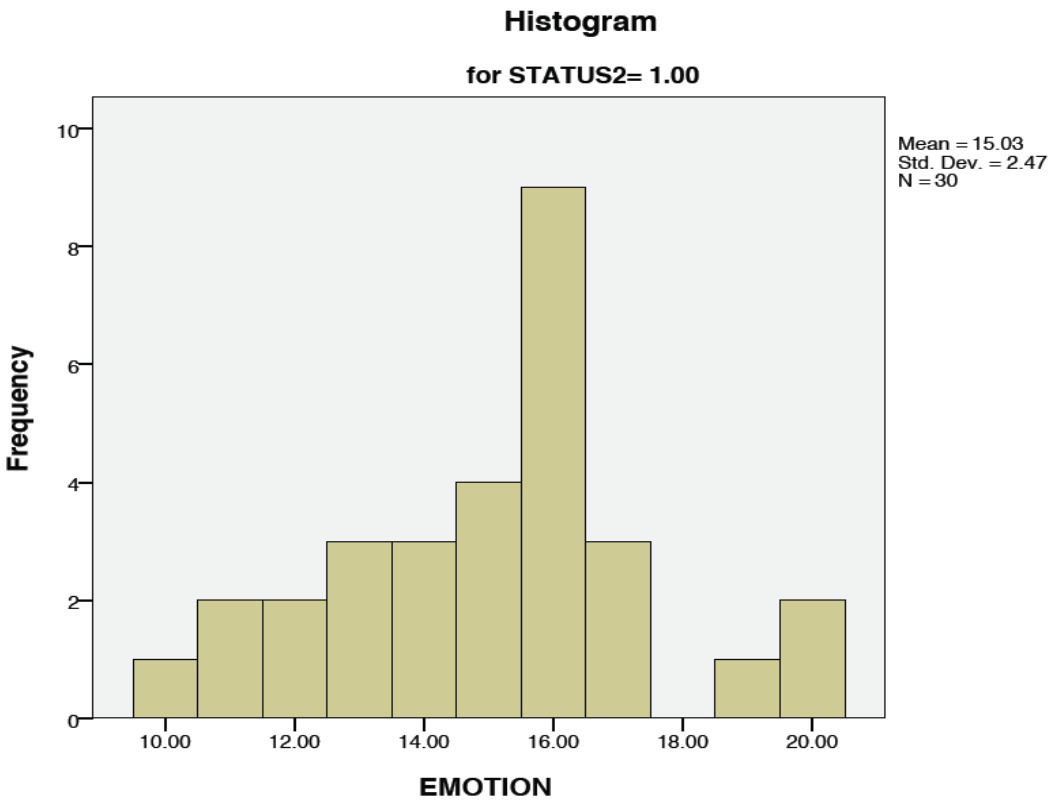
Thank you very much for your participation.
Our aim is to present an educational model for ADHD syndrome. This will direct us to develop an appropriate teaching pedagogy for learners with ADHD to enhance their learning. Therefore, the results will be useful for AD/HD students and participants will receive an overall summary of the final results.
The results will be used for a university doctorate thesis and will be submitted for publication to an academic journal. The research will be completely confidential and you will not be identified within the results. To participate in further steps, please contact the email address below:
samirasadat.sajadi@brunel.ac.uk

Appendix (E): Normality Tests / Man-Whitney Tests

Normality Test



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Mean = 15.03
Std. Dev. = 2.47
N = 30
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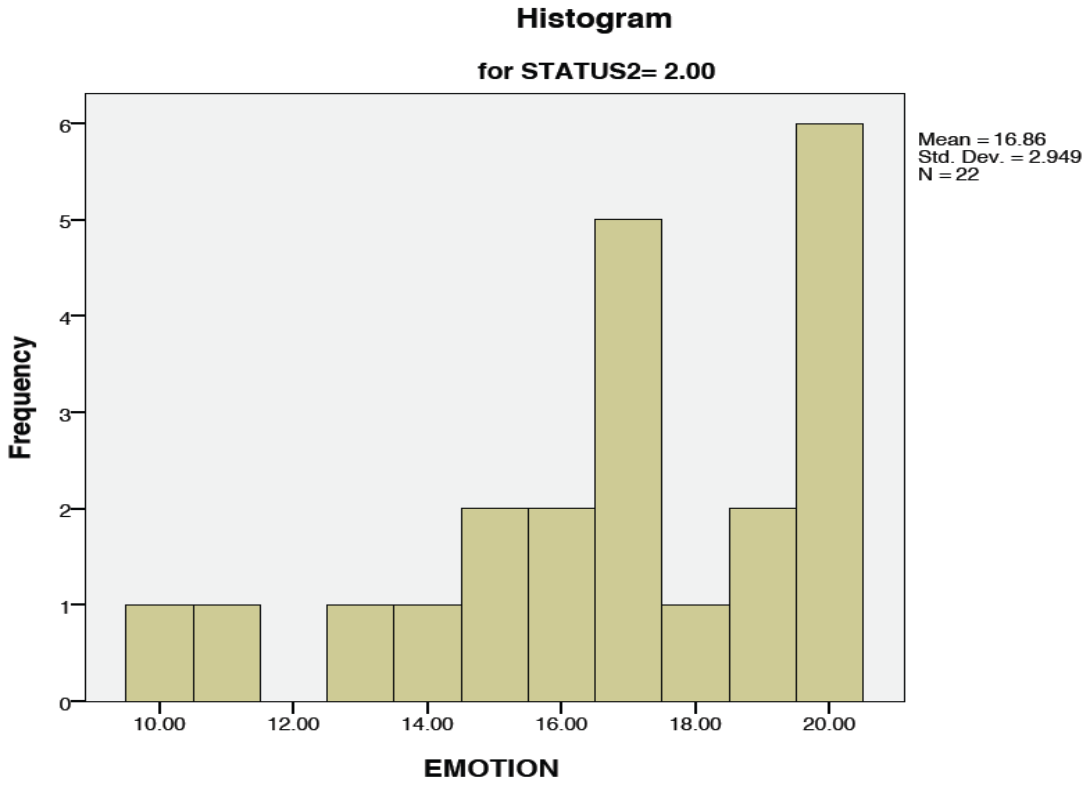
4
6
8
10
10.00
12.00
14.00
16.00
18.00
20.00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for STATUS2= 2.00
Mean = 16.86
Std. Dev. = 2.949
N = 22
Frequency
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2
3
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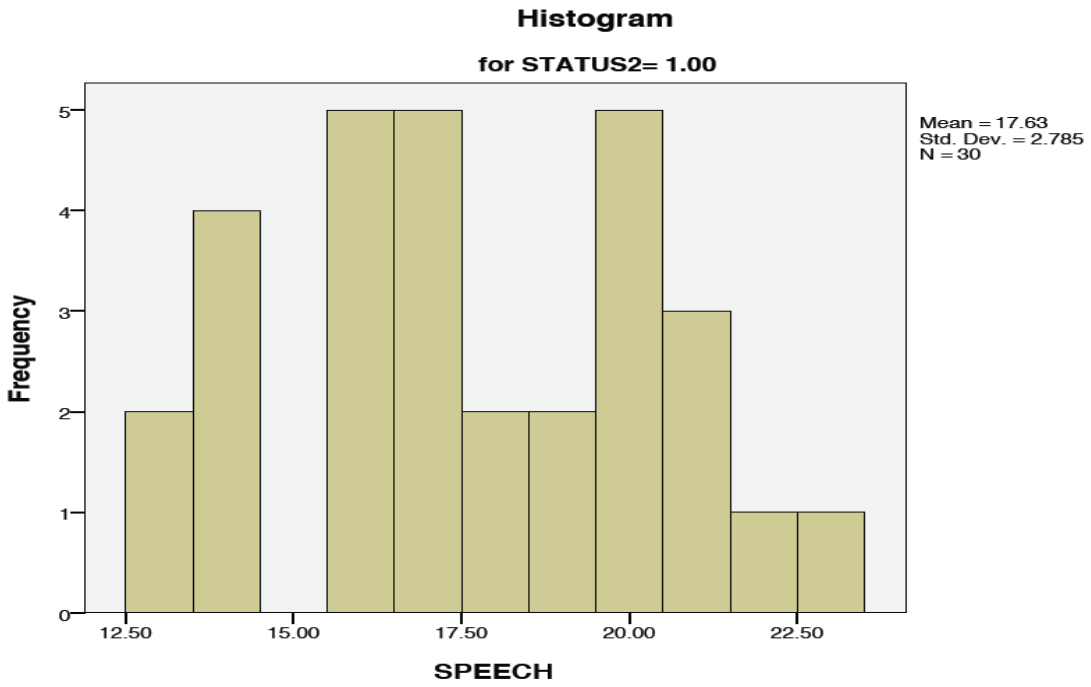
16.00
18.00
20.00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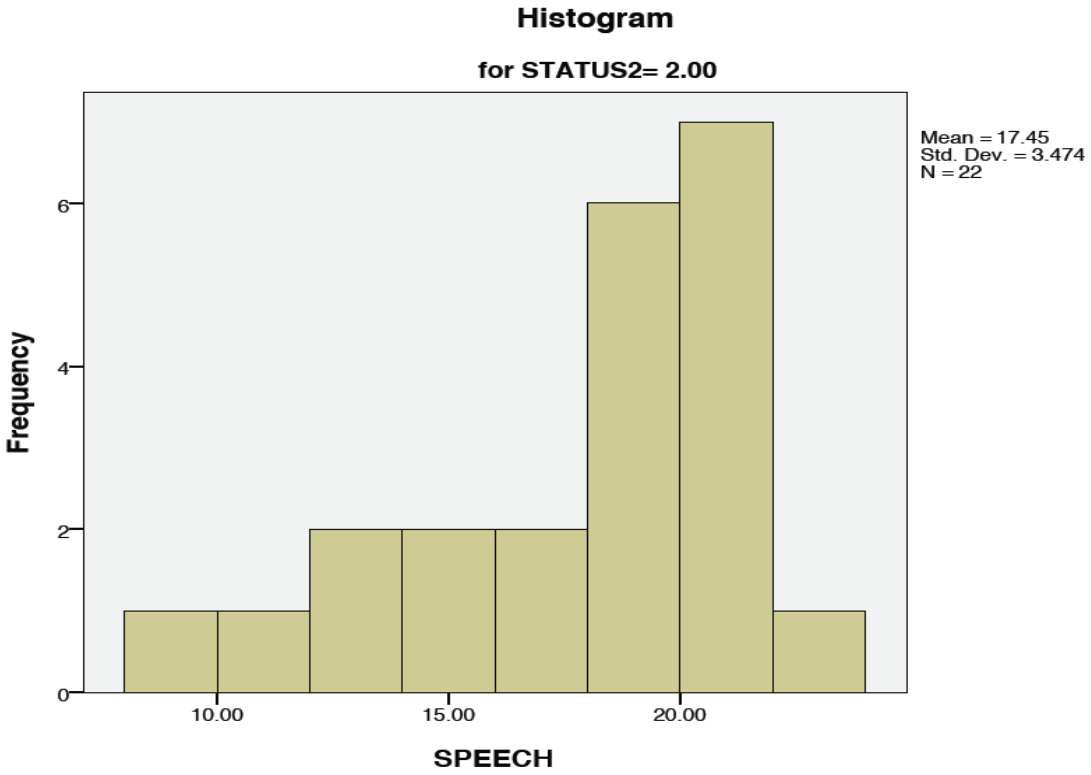
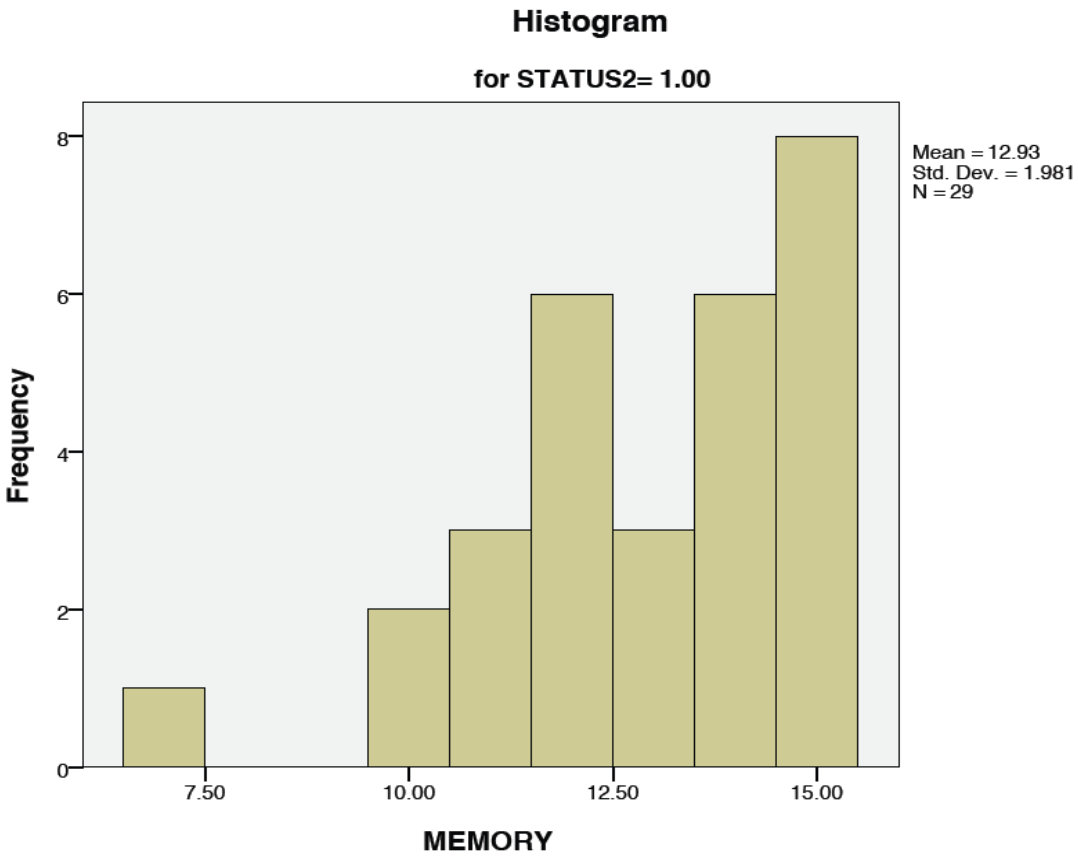
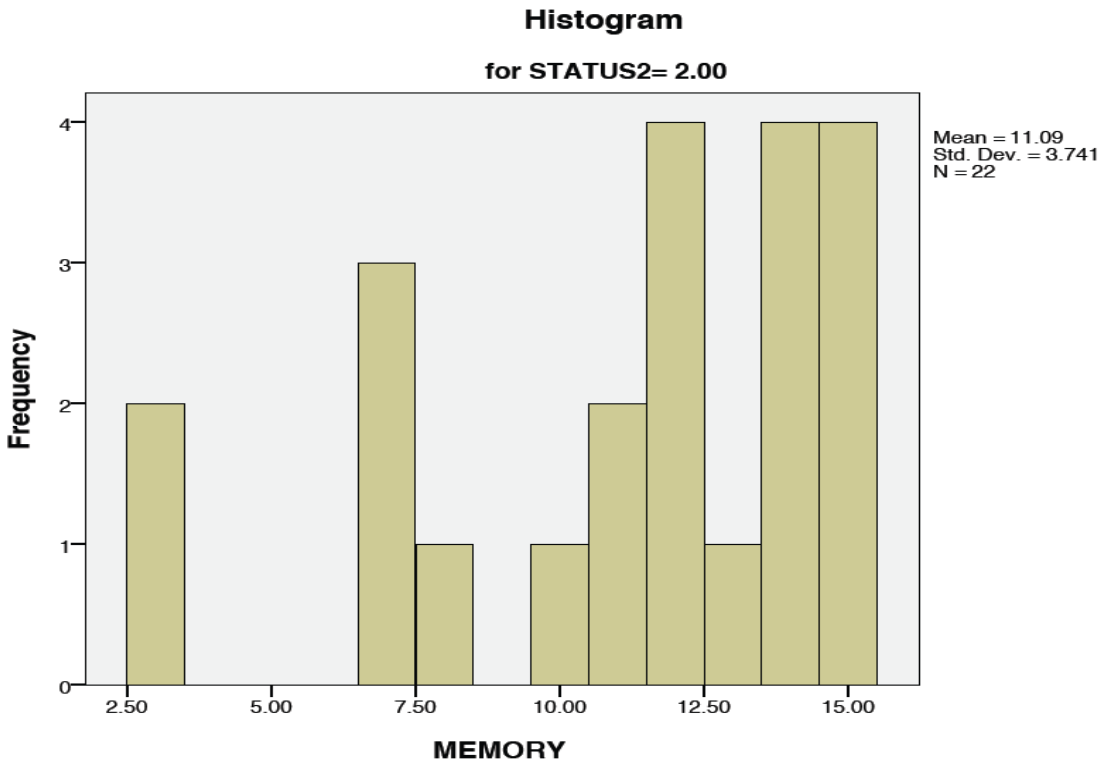
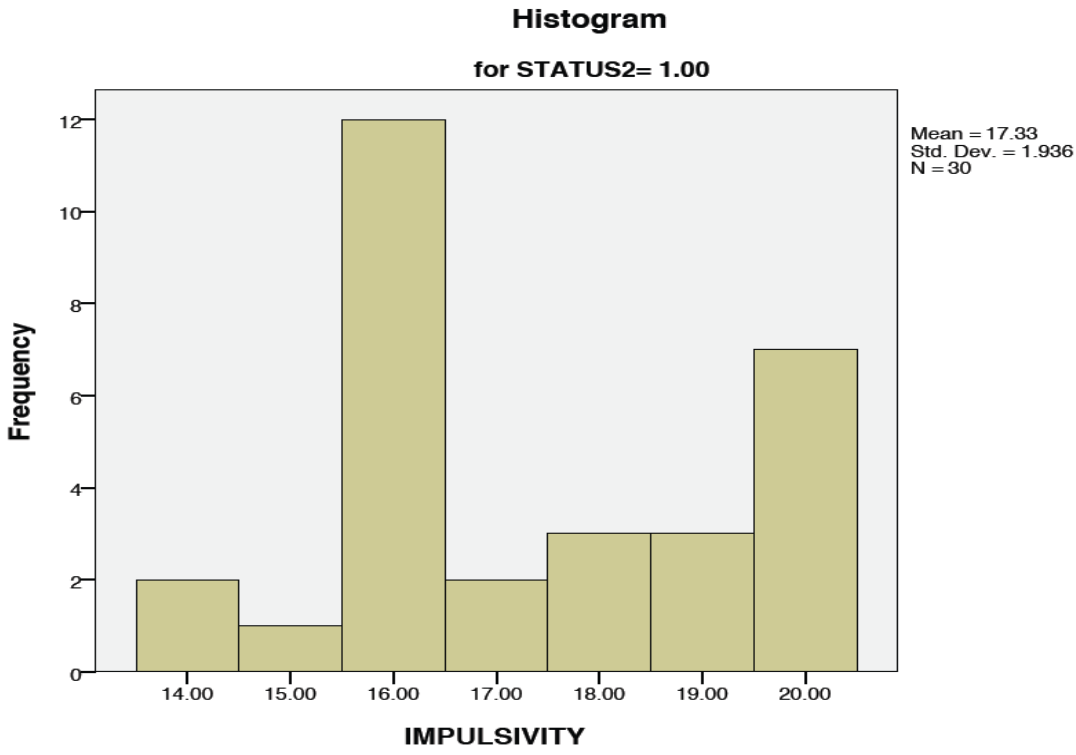
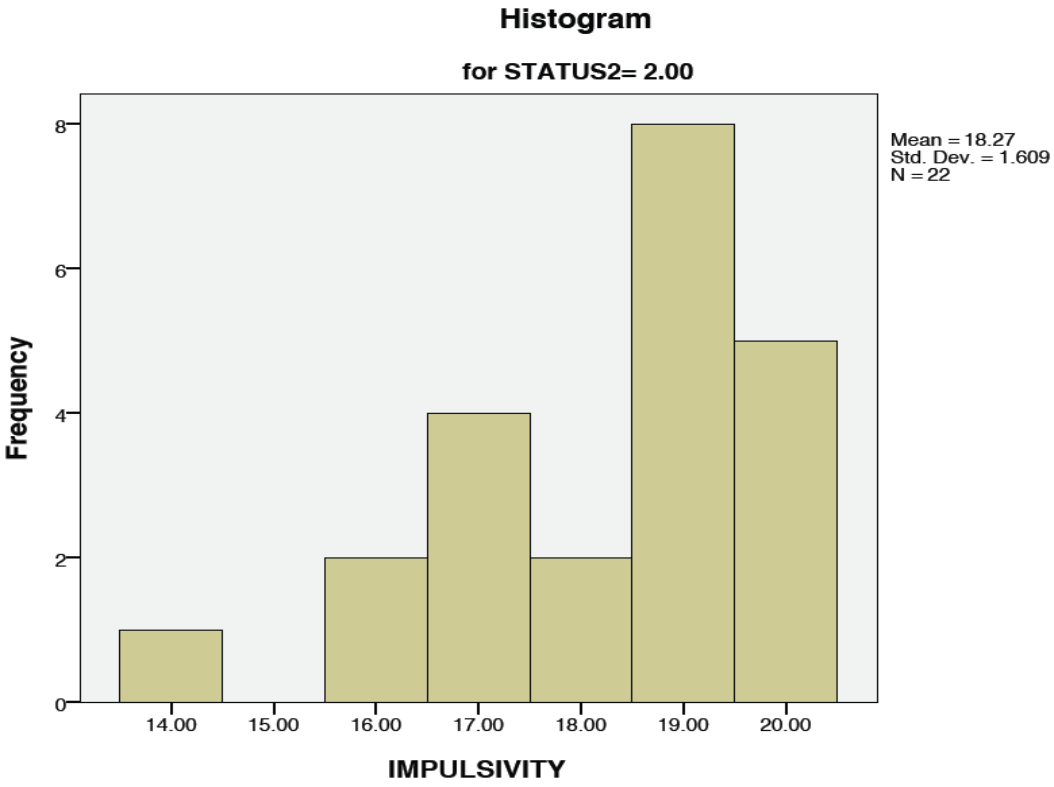
for STATUS2= 1.00
Mean = 17.63
Std. Dev. = 2.785
N = 30
Frequency
0
1
2
3
4
5
12.50
15.00
17.50
20.00
22.50
SPEECH

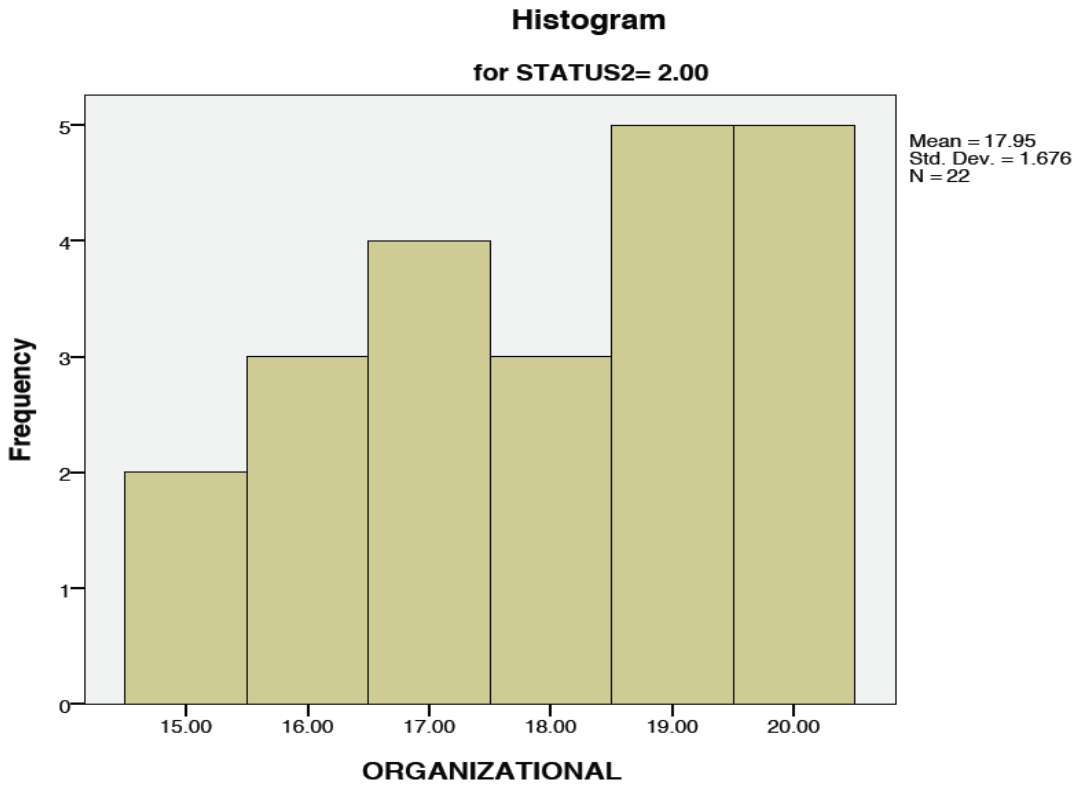

Histogram
for STATUS2= 2.00
Mean = 17.45
Std. Dev. = 3.474
N = 22
Frequency
0
2
4
6
10.00
15.00
20.00
SPEECH

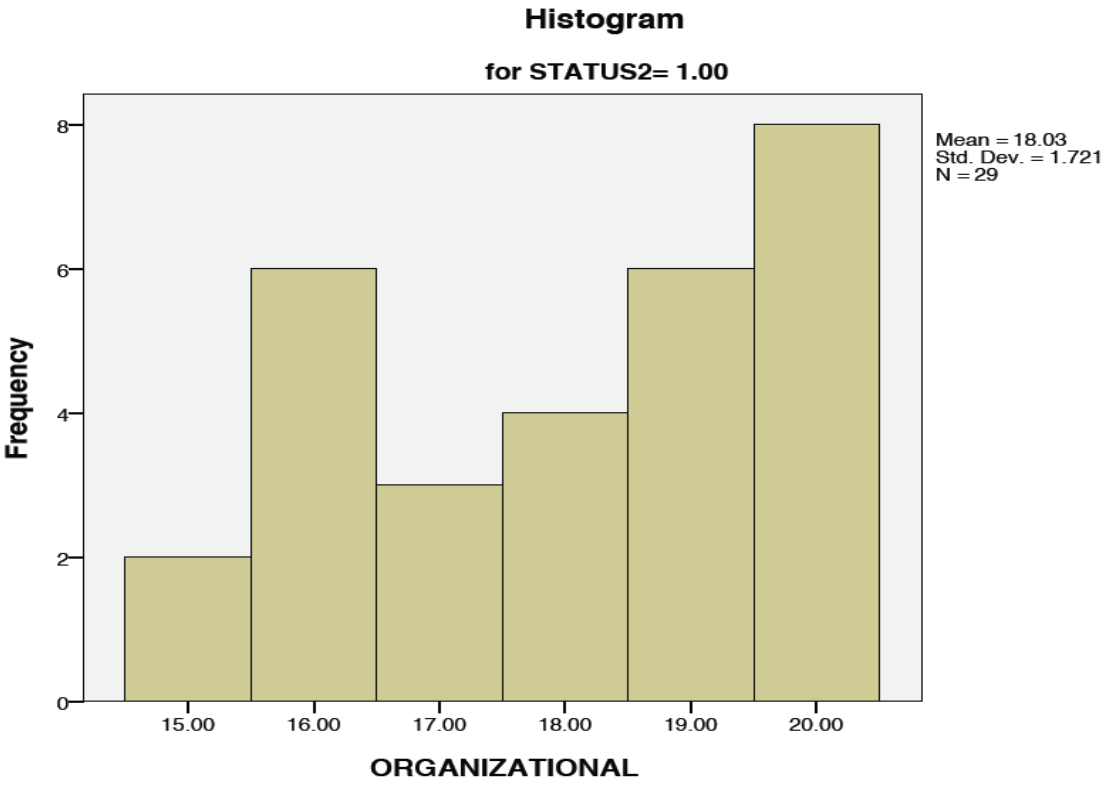

Histogram
for STATUS2= 1.00
Mean = 12.93
Std. Dev. = 1.981
N = 29
Frequency
0
2
4
6
8
7.50
10.00
12.50
15.00
MEMORY

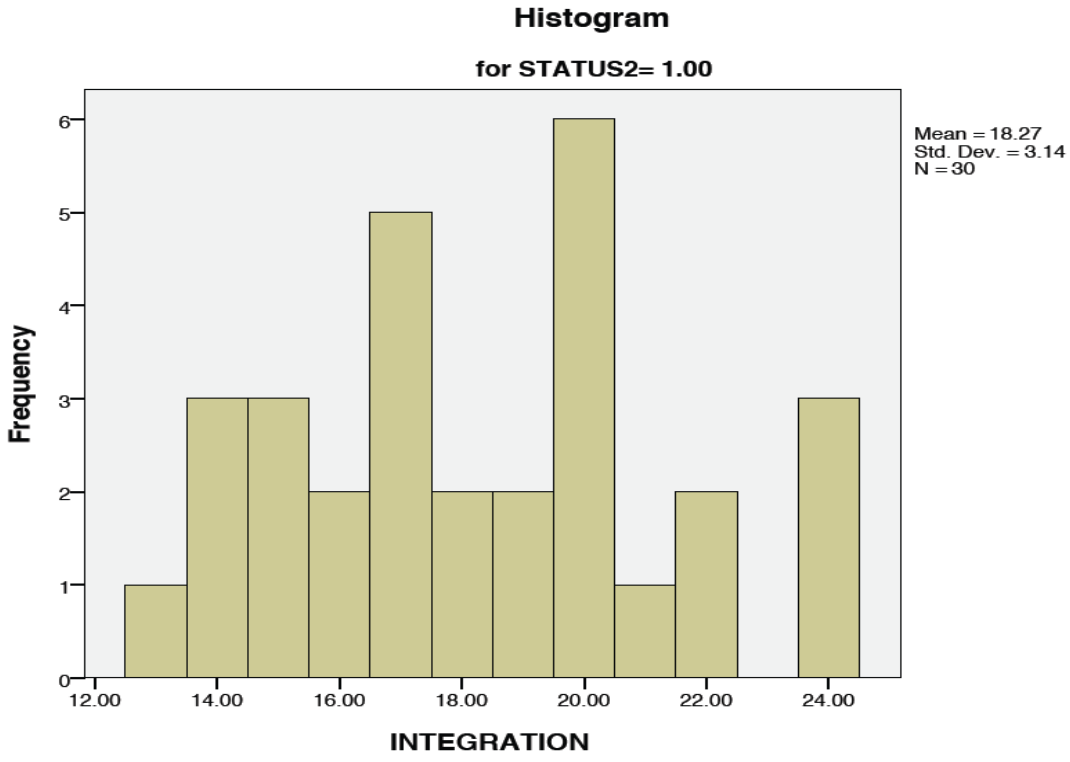

Histogram
for STATUS2= 2.00
Mean = 11.09
Std. Dev. = 3.741
N = 22
Frequency
0
1
2
3
4
2.50
5.00
7.50
10.00
12.50
15.00
MEMORY

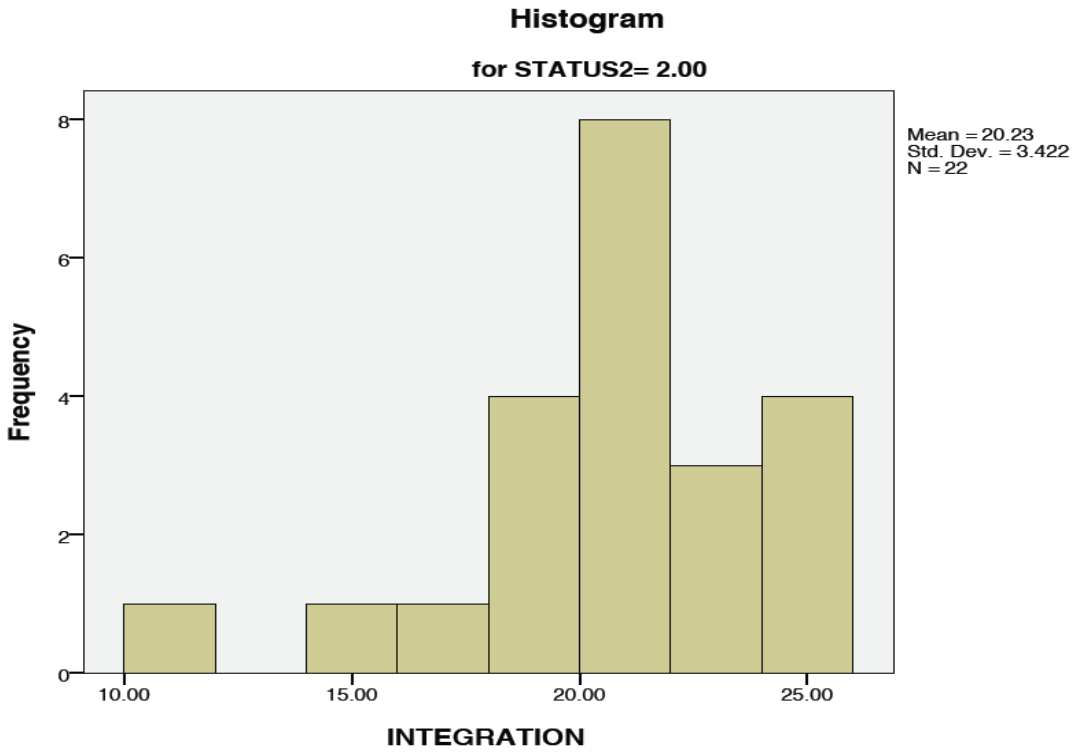

Histogram
for STATUS2= 1.00
Mean = 17.33
Std. Dev. = 1.936
N = 30
Frequency
0
2
4
6
8
10
12
14.00
15.00
16.00
17.00
18.00
19.00
20.00
IMPULSIVITY

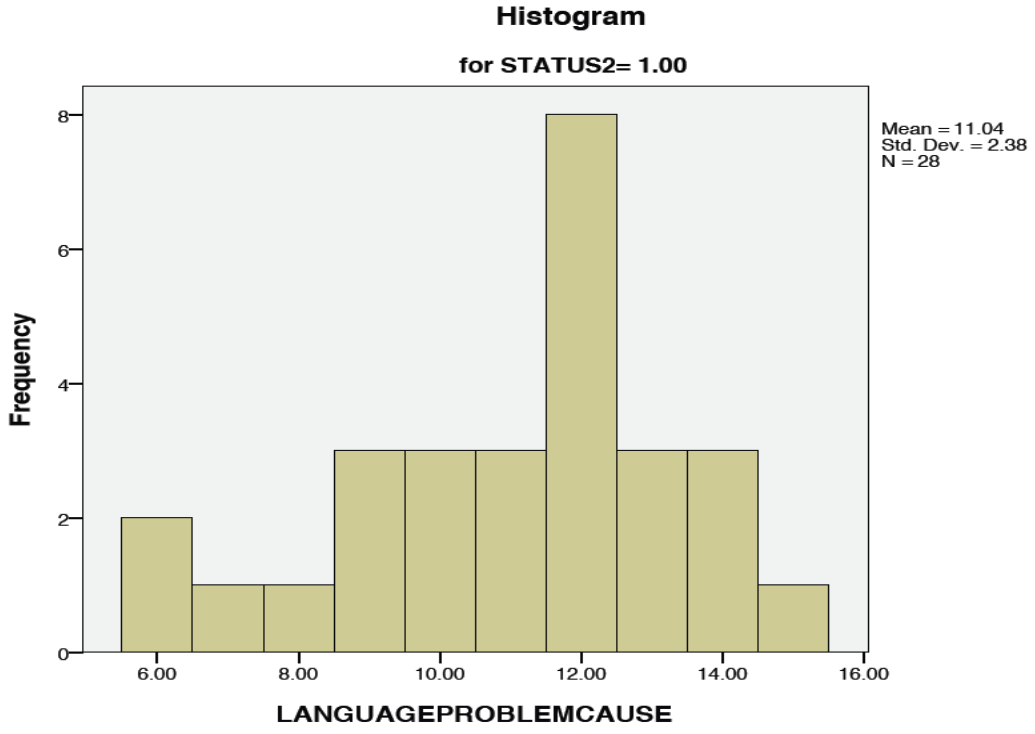

Histogram
for STATUS2= 2.00
Mean = 18.27
Std. Dev. = 1.609
N = 22
Frequency
0
2
4
6
8
14.00
15.00
16.00
17.00
18.00
19.00
20.00
IMPULSIVITY

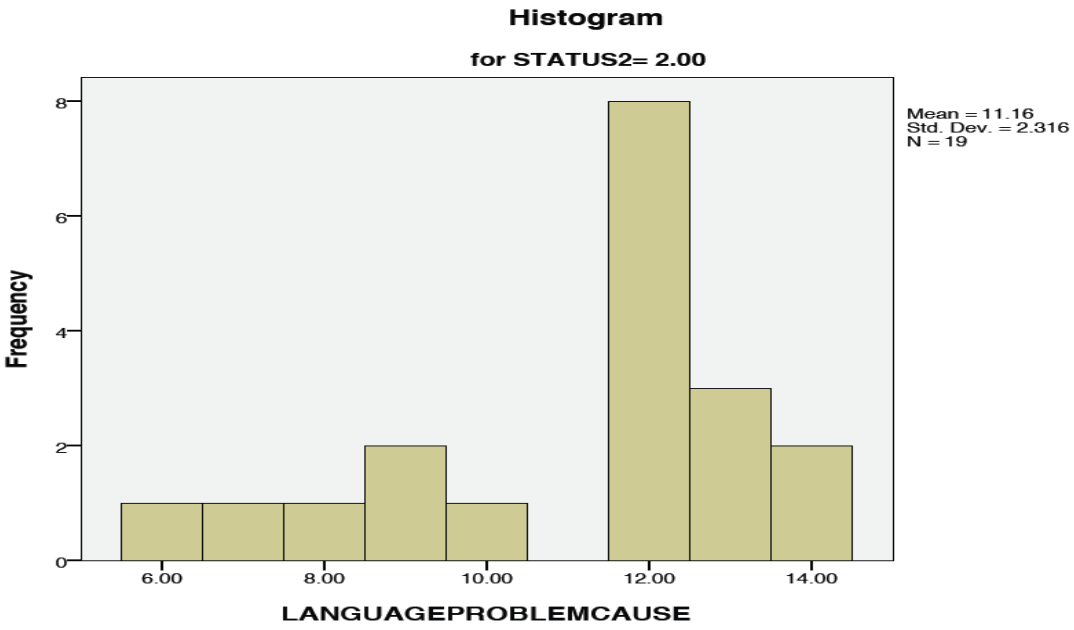

Histogram
for STATUS2= 2.00
Mean = 17.95
Std. Dev. = 1.676
N = 22
Frequency
0
1
2
3
4
5
15.00
16.00
17.00
18.00
19.00
20.00
ORGANIZATIONAL

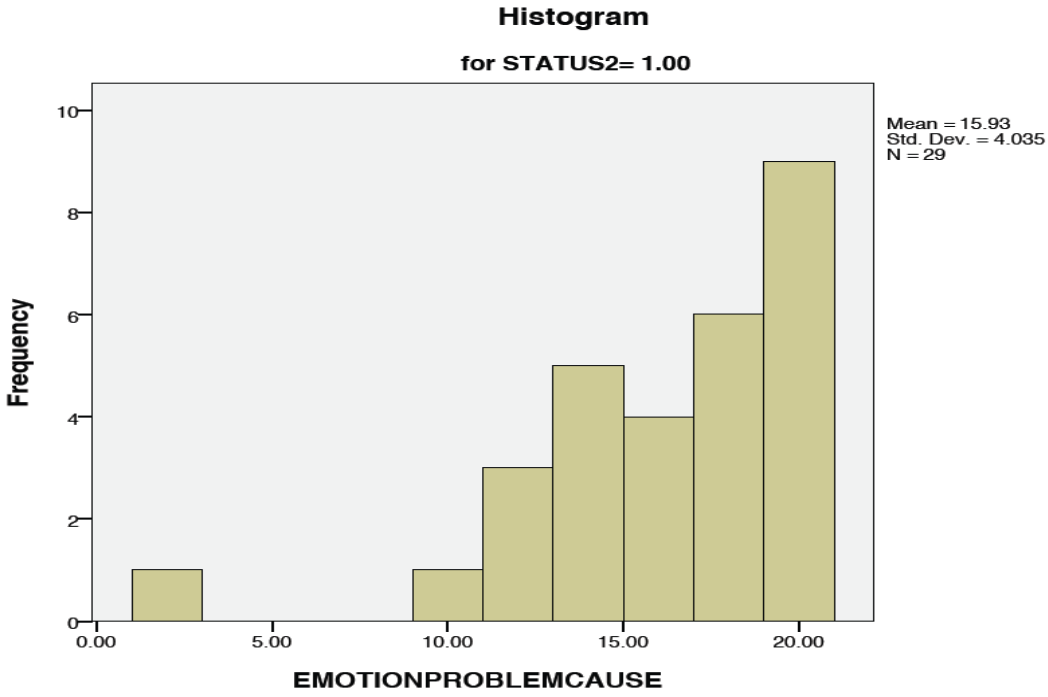

Histogram
for STATUS2= 1.00
Mean = 18.03
Std. Dev. = 1.721
N = 29
Frequency
0
2
4
6
8
15.00
16.00
17.00
18.00
19.00
20.00
ORGANIZATIONAL

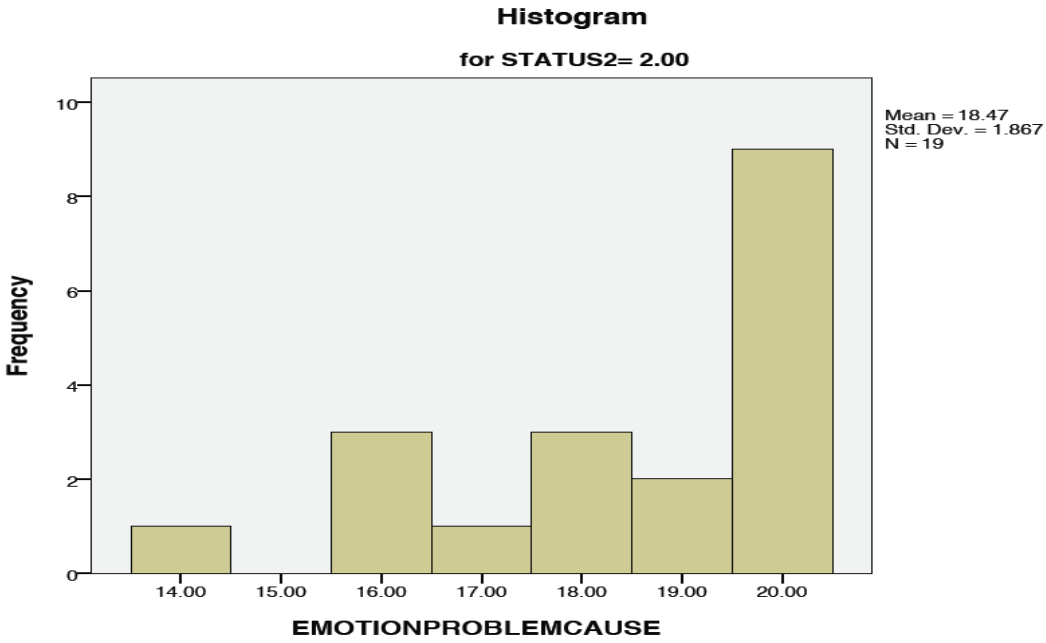

Histogram
for STATUS2= 1.00
Mean = 18.27
Std. Dev. = 3.14
N = 30
Frequency
0
1
2
3
4
5
6
12.00
14.00
16.00
18.00
20.00
22.00
24.00
INTEGRATION

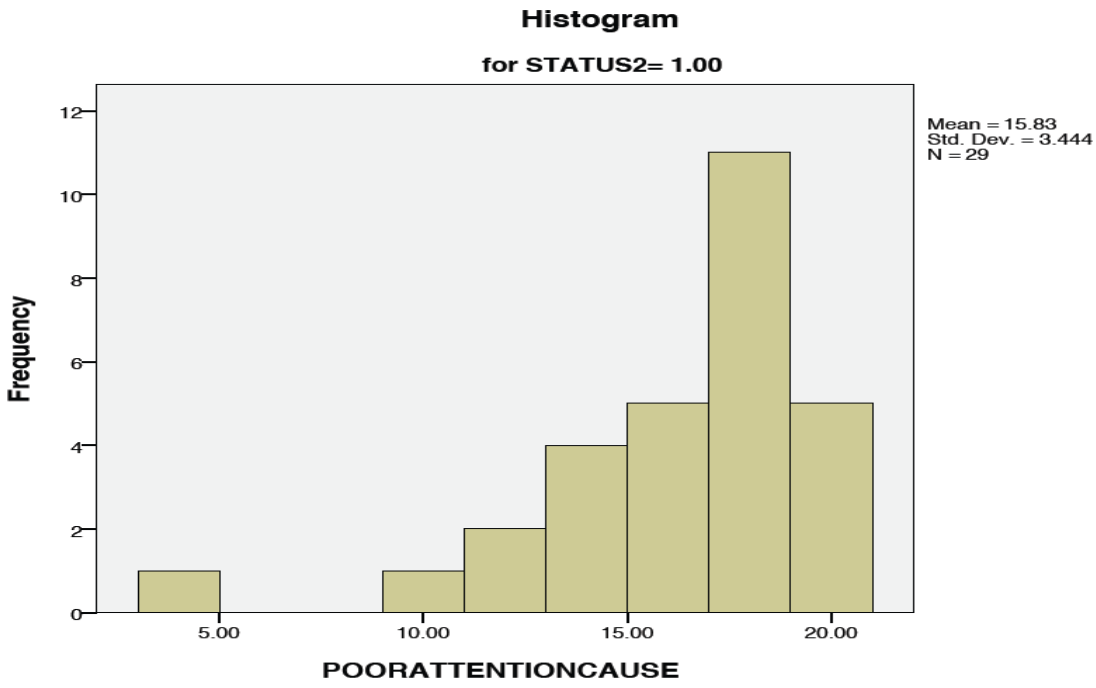

Histogram
for STATUS2= 2.00
Mean = 20.23
Std. Dev. = 3.422
N = 22
Frequency
0
2
4
6
8
10.00
15.00
20.00
25.00
INTEGRATION

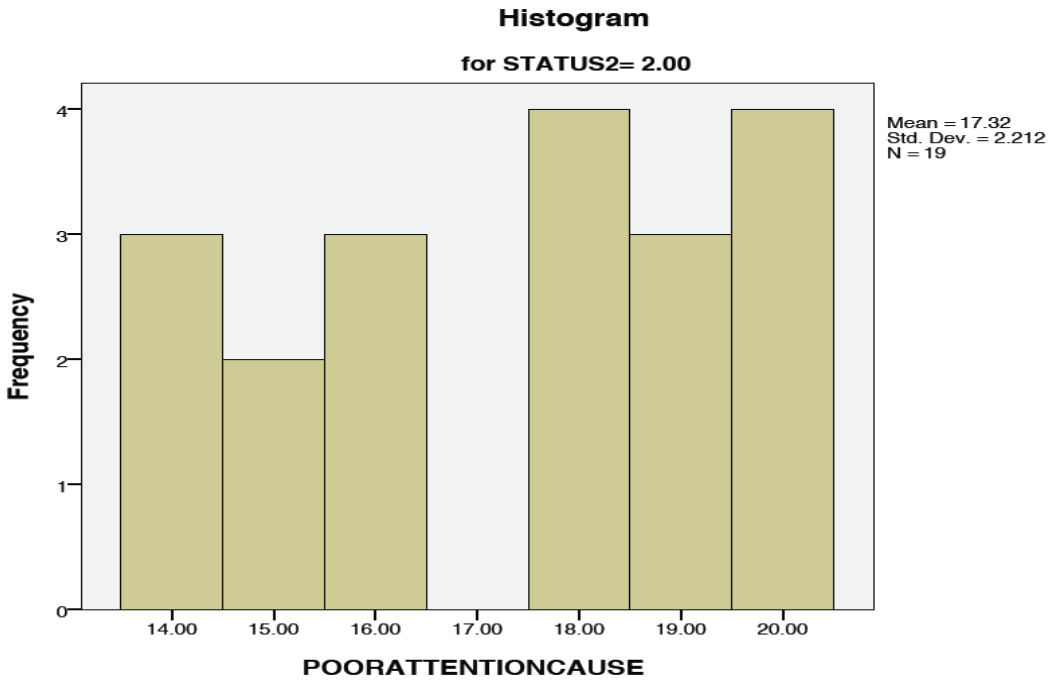

Histogram
for STATUS2= 1.00
Mean = 11.04
Std. Dev. = 2.38
N = 28
Frequency
0
2
4
6
8
6.00
8.00
10.00
12.00
14.00
16.00
LANGUAGEPROBLEMCAUSE

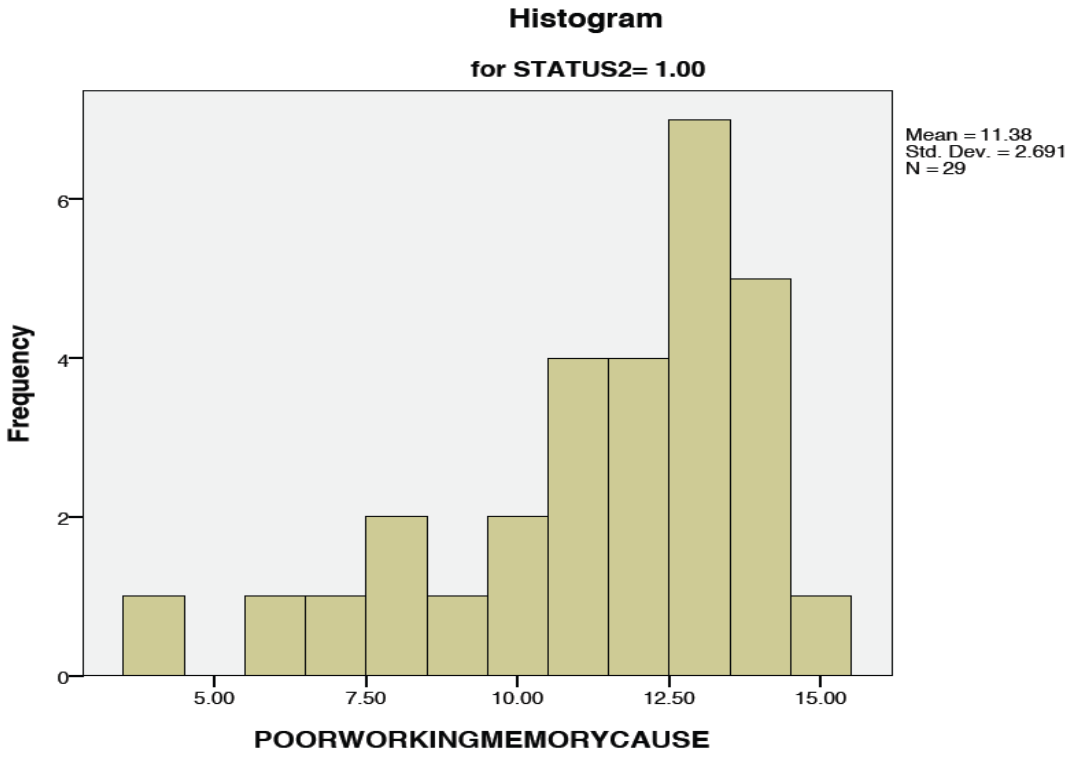

Histogram
for STATUS2= 2.00
Mean = 11.16
Std. Dev. = 2.316
N = 19
Frequency
0
2
4
6
8
6.00
8.00
10.00
12.00
14.00
LANGUAGEPROBLEMCAUSE

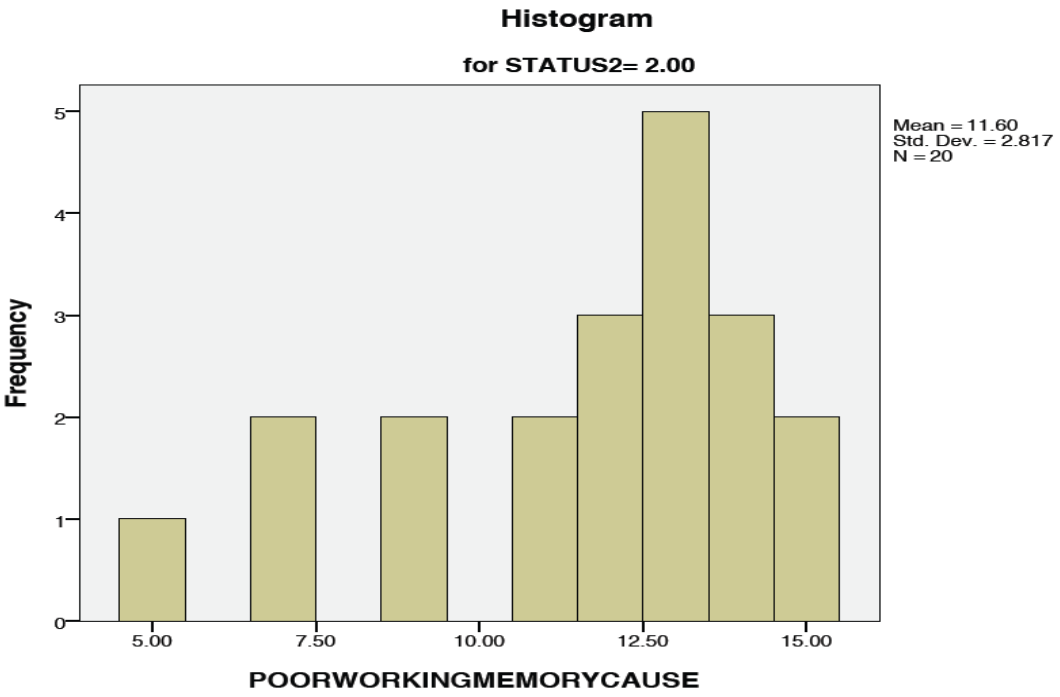

Histogram
for STATUS2= 1.00
Mean = 15.93
Std. Dev. = 4.035
N = 29
Frequency
0
2
4
6
8
10
0.00
5.00
10.00
15.00
20.00
EMOTIONPROBLEMCAUSE

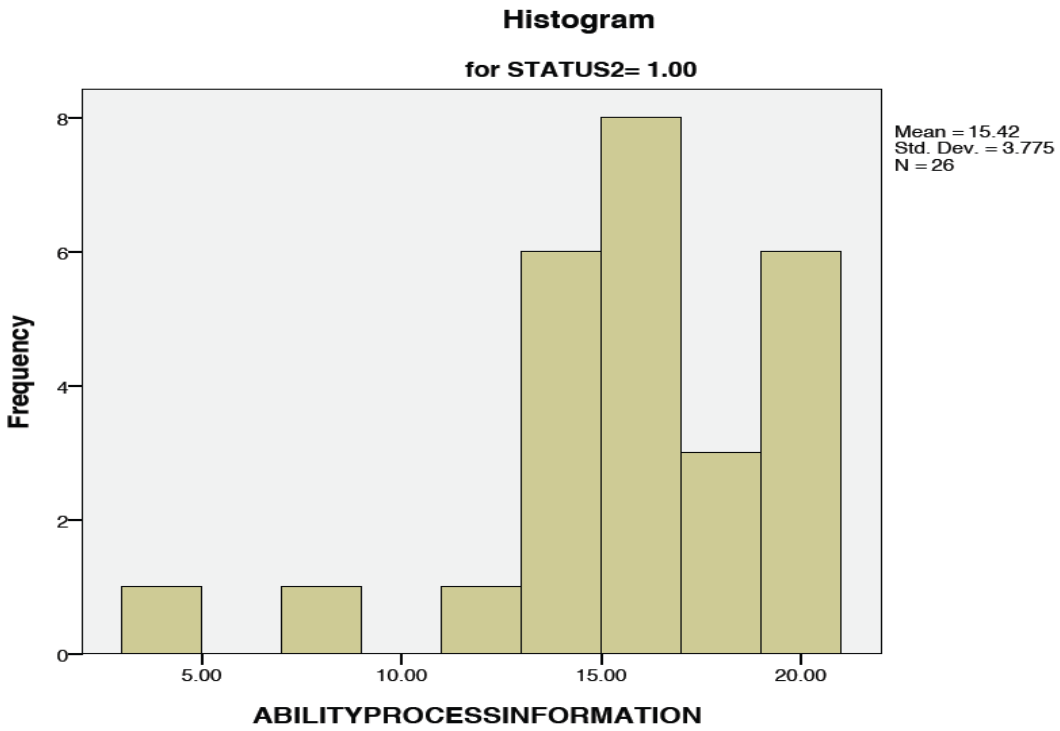

Histogram
for STATUS2= 2.00
Mean = 18.47
Std. Dev. = 1.867
N = 19
Frequency
0
2
4
6
8
10
14.00
15.00
16.00
17.00
18.00
19.00
20.00
EMOTIONPROBLEMCAUSE

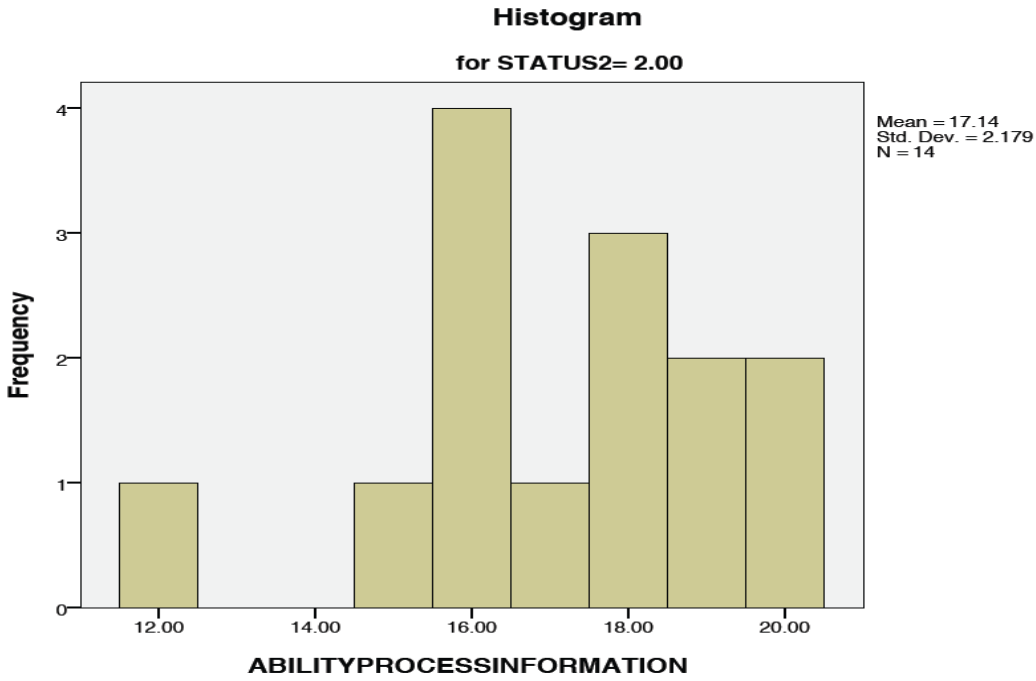

Histogram
for STATUS2= 1.00
Mean = 15.83
Std. Dev. = 3.444
N = 29
Frequency
0
2
4
6
8
10
12
5.00
10.00
15.00
20.00
POORATTENTIONCAUSE

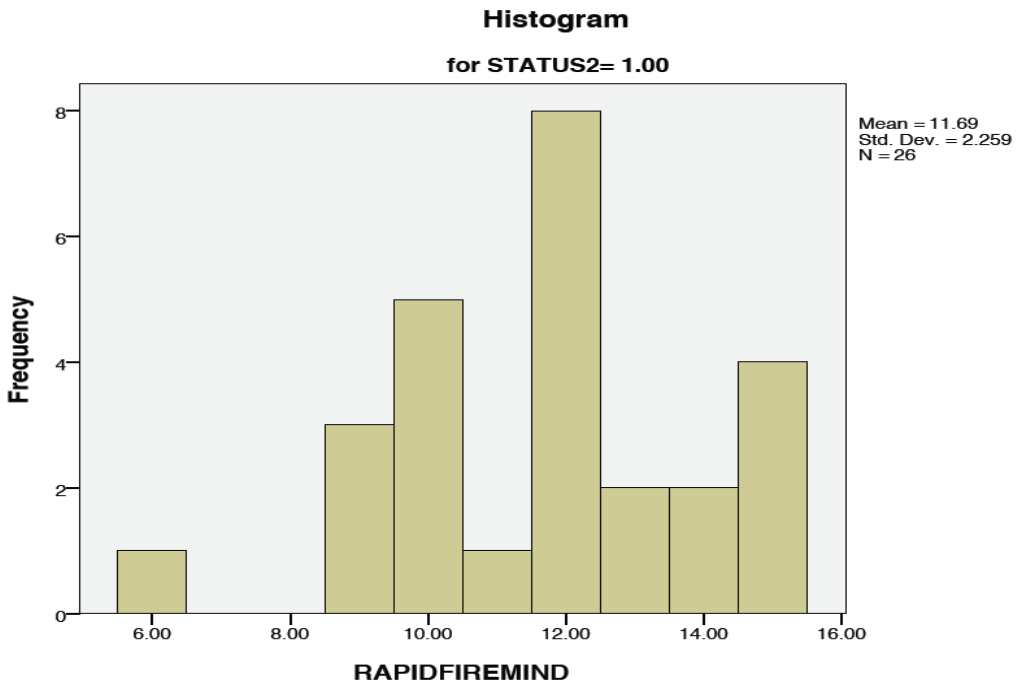

Histogram
for STATUS2= 2.00
Mean = 17.32
Std. Dev. = 2.212
N = 19
Frequency
0
1
2
3
4
14.00
15.00
16.00
17.00
18.00
19.00
20.00
POORATTENTIONCAUSE


Histogram
for STATUS2= 1.00
Mean = 11.38
Std. Dev. = 2.691
N = 29
Frequency
0
2
4
6
5.00
7.50
10.00
12.50
15.00
POORWORKINGMEMORYCAUSE


Histogram
for STATUS2= 2.00
Mean = 11.60
Std. Dev. = 2.817
N = 20
Frequency
0
1
2
3
4
5
5.00
7.50
10.00
12.50
15.00
POORWORKINGMEMORYCAUSE


Histogram
for STATUS2= 1.00
Mean = 15.42
Std. Dev. = 3.775
N = 26
Frequency
0
2
4
6
8
5.00
10.00
15.00
20.00
ABILITYPROCESSINFORMATION


Histogram
for STATUS2= 2.00
Mean = 17.14
Std. Dev. = 2.179
N = 14
Frequency
0
1
2
3
4
12.00
14.00
16.00
18.00
20.00
ABILITYPROCESSINFORMATION


Histogram
for STATUS2= 1.00
Mean = 11.69
Std. Dev. = 2.259
N = 26
Frequency
0
2
4
6
8
6.00
8.00
10.00
12.00
14.00
16.00
RAPIDFIREMIND

Statistical Tests

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
ATTENTION	52	31.7115	2.82382	26.00	35.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
ATTENTION	29.2500	32.0000	35.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
ATTENTION	1.00	30	25.77	773.00
	2.00	22	27.50	605.00
	Total	52		

Test Statistics[a]

	ATTENTION
Mann-Whitney U	308.000
Wilcoxon W	773.000
Z	-.413
Asymp. Sig. (2-tailed)	.679

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
EMOTION	52	15.8077	2.80782	10.00	20.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
EMOTION	14.0000	16.0000	17.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
EMOTION	1.00	30	21.93	658.00
	2.00	22	32.73	720.00
	Total	52		

Test Statistics[a]

	EMOTION
Mann-Whitney U	193.000
Wilcoxon W	658.000
Z	-2.562
Asymp. Sig. (2-tailed)	.010

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
SPEECH	52	17.5577	3.06411	9.00	23.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
SPEECH	16.0000	18.0000	20.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
SPEECH	1.00	30	26.20	786.00
	2.00	22	26.91	592.00
	Total	52		

Test Statistics[a]

	SPEECH
Mann-Whitney U	321.000
Wilcoxon W	786.000
Z	-.168
Asymp. Sig. (2-tailed)	.867

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
MEMORY	51	12.1373	2.98677	3.00	15.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
MEMORY	11.0000	13.0000	14.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
MEMORY	1.00	29	28.90	838.00
	2.00	22	22.18	488.00
	Total	51		

Test Statistics[a]

	MEMORY
Mann-Whitney U	235.000
Wilcoxon W	488.000
Z	-1.622
Asymp. Sig. (2-tailed)	.105

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
IMPULSIVITY	52	17.7308	1.84832	14.00	20.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
IMPULSIVITY	16.0000	18.0000	19.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
IMPULSIVITY	1.00	30	23.35	700.50
	2.00	22	30.80	677.50
	Total	52		

Test Statistics[a]

	IMPULSIVITY
Mann-Whitney U	235.500
Wilcoxon W	700.500
Z	-1.790
Asymp. Sig. (2-tailed)	.074

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
ORGANIZATIONAL	51	18.0000	1.68523	15.00	20.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
ORGANIZATIONAL	16.0000	18.0000	20.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
ORGANIZATIONAL	1.00	29	26.34	764.00
	2.00	22	25.55	562.00
	Total	51		

Test Statistics[a]

	ORGANIZATIONAL
Mann-Whitney U	309.000
Wilcoxon W	562.000
Z	-.194
Asymp. Sig. (2-tailed)	.846

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
INTEGRATION	52	19.0962	3.37383	11.00	25.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
INTEGRATION	17.0000	20.0000	21.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
INTEGRATION	1.00	30	22.30	669.00
	2.00	22	32.23	709.00
	Total	52		

Test Statistics[a]

	INTEGRATION
Mann-Whitney U	204.000
Wilcoxon W	669.000
Z	-2.346
Asymp. Sig. (2-tailed)	.019

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
LANGUAGEPROBLEMCAUSE	47	11.0851	2.32967	6.00	15.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
LANGUAGEPROBLEMCAUSE	9.0000	12.0000	13.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
LANGUAGEPROBLEMCAUSE	1.00	28	23.46	657.00
	2.00	19	24.79	471.00
	Total	47		

Test Statistics[a]

	LANGUAGEPROBLEMCAUSE
Mann-Whitney U	251.000
Wilcoxon W	657.000
Z	-.333
Asymp. Sig. (2-tailed)	.739

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
EMOTIONPROBLEMCAUSE	48	16.9375	3.55148	2.00	20.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
EMOTIONPROBLEMCAUSE	16.0000	18.0000	20.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
EMOTIONPROBLEMCAUSE	1.00	29	20.52	595.00
	2.00	19	30.58	581.00
	Total	48		

Test Statistics[a]

	EMOTIONPROBLEMCAUSE
Mann-Whitney U	160.000
Wilcoxon W	595.000
Z	-2.483
Asymp. Sig. (2-tailed)	.013

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
POORATTENTIONCAUSE	48	16.4167	3.07933	4.00	20.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
POORATTENTIONCAUSE	15.0000	17.0000	18.7500
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
POORATTENTIONCAUSE	1.00	29	22.09	640.50
	2.00	19	28.18	535.50
	Total	48		

Test Statistics[a]

	POORATTENTIONCAUSE
Mann-Whitney U	205.500
Wilcoxon W	640.500
Z	-1.490
Asymp. Sig. (2-tailed)	.136

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
POORATTENTIONCAUSE	48	16.4167	3.07933	4.00	20.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
POORATTENTIONCAUSE	15.0000	17.0000	18.7500
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
POORATTENTIONCAUSE	1.00	29	22.09	640.50
	2.00	19	28.18	535.50
	Total	48		

Test Statistics[a]

	POORATTENTIONCAUSE
Mann-Whitney U	205.500
Wilcoxon W	640.500
Z	-1.490
Asymp. Sig. (2-tailed)	.136

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
POORWORKINGMEMORY	49	11.4694	2.71648	4.00	15.00
CAUSE					
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
POORWORKINGMEMORY	10.0000	12.0000	13.0000
CAUSE			
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
POORWORKINGMEMORYC	1.00	29	24.31	705.00
AUSE	2.00	20	26.00	520.00
	Total	49		

Test Statistics[a]

	POORWORKINGMEMORYCAUSE
Mann-Whitney U	270.000
Wilcoxon W	705.000
Z	-.412
Asymp. Sig. (2-tailed)	.680

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
ABILITYPROCESSINFORMATION	40	16.0250	3.37781	4.00	20.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
ABILITYPROCESSINFORMATION	14.2500	16.0000	18.7500
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
ABILITYPROCESSINFORMATION	1.00	26	18.54	482.00
	2.00	14	24.14	338.00
	Total	40		

Test Statistics[b]

	ABILITYPROCESSINFORMATION
Mann-Whitney U	131.000
Wilcoxon W	482.000
Z	-1.464
Asymp. Sig. (2-tailed)	.143
Exact Sig. [2*(1-tailed Sig.)]	.154[a]

a. Not corrected for ties.

b. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
RAPIDFIREMIND	40	12.0000	2.11224	6.00	15.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
RAPIDFIREMIND	10.2500	12.0000	13.7500
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
RAPIDFIREMIND	1.00	26	18.94	492.50
	2.00	14	23.39	327.50
	Total	40		

Test Statistics[b]

	RAPIDFIREMIND
Mann-Whitney U	141.500
Wilcoxon W	492.500
Z	-1.174
Asymp. Sig. (2-tailed)	.240
Exact Sig. [2*(1-tailed Sig.)]	.254[a]

a. Not corrected for ties.

b. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
HOURSOFENGAGEMENT	40	10.5750	2.97759	2.00	15.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
HOURSOFENGAGEMENT	8.2500	12.0000	12.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
HOURSOFENGAGEMENT	1.00	26	17.88	465.00
	2.00	14	25.36	355.00
	Total	40		

Test Statistics[b]

	HOURSOFENGAGEMENT
Mann-Whitney U	114.000
Wilcoxon W	465.000
Z	-1.967
Asymp. Sig. (2-tailed)	.049
Exact Sig. [2*(1-tailed Sig.)]	.055[a]

a. Not corrected for ties.

b. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QTHIRTEENTWO	46	3.9783	.77428	2.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QTHIRTEENTWO	4.0000	4.0000	4.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QTHIRTEENTWO	1.00	28	22.75	637.00
	2.00	18	24.67	444.00
	Total	46		

Test Statistics[a]

	QTHIRTEENTWO
Mann-Whitney U	231.000
Wilcoxon W	637.000
Z	-.541
Asymp. Sig. (2-tailed)	.588

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QTHIRTEENONE	47	4.0638	.91851	1.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QTHIRTEENONE	4.0000	4.0000	5.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QTHIRTEENONE	1.00	28	24.34	681.50
	2.00	19	23.50	446.50
	Total	47		

Test Statistics[a]

	QTHIRTEENONE
Mann-Whitney U	256.500
Wilcoxon W	446.500
Z	-.226
Asymp. Sig. (2-tailed)	.821

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QTHIRTEENTHREE	47	3.8511	.93201	2.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QTHIRTEENTHREE	3.0000	4.0000	5.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QTHIRTEENTHREE	1.00	28	23.21	650.00
	2.00	19	25.16	478.00
	Total	47		

Test Statistics[a]

	QTHIRTEENTHREE
Mann-Whitney U	244.000
Wilcoxon W	650.000
Z	-.507
Asymp. Sig. (2-tailed)	.612

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QTHIRTEENFOUR	48	3.9583	1.03056	1.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QTHIRTEENFOUR	4.0000	4.0000	5.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QTHIRTEENFOUR	1.00	28	24.34	681.50
	2.00	20	24.73	494.50
	Total	48		

Test Statistics[a]

	QTHIRTEENFOUR
Mann-Whitney U	275.500
Wilcoxon W	681.500
Z	-.100
Asymp. Sig. (2-tailed)	.920

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QTHIRTEENFIVE	47	3.4255	1.07834	1.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QTHIRTEENFIVE	3.0000	4.0000	4.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QTHIRTEENFIVE	1.00	28	22.48	629.50
	2.00	19	26.24	498.50
	Total	47		

Test Statistics[a]

	QTHIRTEENFIVE
Mann-Whitney U	223.500
Wilcoxon W	629.500
Z	-.955
Asymp. Sig. (2-tailed)	.339

a. Grouping Variable: STATUS-2

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QTHIRTEENSIX	1.00	28	24.32	681.00
	2.00	19	23.53	447.00
	Total	47		

Test Statistics[a]

	QTHIRTEENSIX
Mann-Whitney U	257.000
Wilcoxon W	447.000
Z	-.206
Asymp. Sig. (2-tailed)	.837

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QTHIRTEENSEVEN	47	3.5957	1.01424	1.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QTHIRTEENSEVEN	3.0000	4.0000	4.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QTHIRTEENSEVEN	1.00	28	24.59	688.50
	2.00	19	23.13	439.50
	Total	47		

Test Statistics[a]

	QTHIRTEENSEVEN
Mann-Whitney U	249.500
Wilcoxon W	439.500
Z	-.384
Asymp. Sig. (2-tailed)	.701

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QTHIRTEENEIGHT	47	4.1489	.83350	2.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QTHIRTEENEIGHT	4.0000	4.0000	5.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QTHIRTEENEIGHT	1.00	28	22.05	617.50
	2.00	19	26.87	510.50
	Total	47		

Test Statistics[a]

	QTHIRTEENEIGHT
Mann-Whitney U	211.500
Wilcoxon W	617.500
Z	-1.293
Asymp. Sig. (2-tailed)	.196

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QTHIRTEENNINE	48	3.1875	1.02431	1.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QTHIRTEENNINE	2.0000	3.0000	4.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QTHIRTEENNINE	1.00	29	22.10	641.00
	2.00	19	28.16	535.00
	Total	48		

Test Statistics[a]

	QTHIRTEENNINE
Mann-Whitney U	206.000
Wilcoxon W	641.000
Z	-1.539
Asymp. Sig. (2-tailed)	.124

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QTHIRTEENTEN	47	3.9787	.92052	2.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QTHIRTEENTEN	4.0000	4.0000	5.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QTHIRTEENTEN	1.00	28	23.73	664.50
	2.00	19	24.39	463.50
	Total	47		

Test Statistics[a]

	QTHIRTEENTEN
Mann-Whitney U	258.500
Wilcoxon W	664.500
Z	-.176
Asymp. Sig. (2-tailed)	.860

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QTHIRTEENELEVEN	48	4.5000	.74377	2.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QTHIRTEENELEVEN	4.0000	5.0000	5.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QTHIRTEENELEVEN	1.00	29	22.45	651.00
	2.00	19	27.63	525.00
	Total	48		

Test Statistics[a]

	QTHIRTEENELEVEN
Mann-Whitney U	216.000
Wilcoxon W	651.000
Z	-1.456
Asymp. Sig. (2-tailed)	.146

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QTHIRTEENTWELVE	45	4.4444	.81340	2.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QTHIRTEENTWELVE	4.0000	5.0000	5.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QTHIRTEENTWELVE	1.00	26	21.35	555.00
	2.00	19	25.26	480.00
	Total	45		

Test Statistics[a]

	QTHIRTEENTWELVE
Mann-Whitney U	204.000
Wilcoxon W	555.000
Z	-1.134
Asymp. Sig. (2-tailed)	.257

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QTHIRTEENTHIRTEEN	48	4.2708	.96182	2.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QTHIRTEENTHIRTEEN	4.0000	5.0000	5.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QTHIRTEENTHIRTEEN	1.00	29	20.97	608.00
	2.00	19	29.89	568.00
	Total	48		

Test Statistics[a]

	QTHIRTEENTHIRTEEN
Mann-Whitney U	173.000
Wilcoxon W	608.000
Z	-2.387
Asymp. Sig. (2-tailed)	.017

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QTHIRTEENFOURTEEN	46	4.2174	.81413	2.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QTHIRTEENFOURTEEN	4.0000	4.0000	5.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QTHIRTEENFOURTEEN	1.00	28	21.32	597.00
	2.00	18	26.89	484.00
	Total	46		

Test Statistics[a]

	QTHIRTEENFOURTEEN
Mann-Whitney U	191.000
Wilcoxon W	597.000
Z	-1.478
Asymp. Sig. (2-tailed)	.139

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QTHIRTEENFIFTEEN	47	4.1489	.88413	2.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QTHIRTEENFIFTEEN	4.0000	4.0000	5.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QTHIRTEENFIFTEEN	1.00	28	21.05	589.50
	2.00	19	28.34	538.50
	Total	47		

Test Statistics[a]

	QTHIRTEENFIFTEEN
Mann-Whitney U	183.500
Wilcoxon W	589.500
Z	-1.922
Asymp. Sig. (2-tailed)	.055

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QTHIRTEENSIXTEEN	46	4.6522	.56637	3.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QTHIRTEENSIXTEEN	4.0000	5.0000	5.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QTHIRTEENSIXTEEN	1.00	27	21.02	567.50
	2.00	19	27.03	513.50
	Total	46		

Test Statistics[a]

	QTHIRTEENSIXTEEN
Mann-Whitney U	189.500
Wilcoxon W	567.500
Z	-1.860
Asymp. Sig. (2-tailed)	.063

a. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QFOURTEENSIX	40	4.3250	.72986	2.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QFOURTEENSIX	4.0000	4.0000	5.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QFOURTEENSIX	1.00	26	20.52	533.50
	2.00	14	20.46	286.50
	Total	40		

Test Statistics[b]

	QFOURTEENSIX
Mann-Whitney U	181.500
Wilcoxon W	286.500
Z	-.016
Asymp. Sig. (2-tailed)	.987
Exact Sig. [2*(1-tailed Sig.)]	.989[a]

a. Not corrected for ties.

b. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
BLURTOUTANSWER	30	4.2667	.94443	1.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
BLURTOUTANSWER	4.0000	4.0000	5.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
BLURTOUTANSWER	1.00	16	13.56	217.00
	2.00	14	17.71	248.00
	Total	30		

Test Statistics[b]

	BLURTOUTANSWER
Mann-Whitney U	81.000
Wilcoxon W	217.000
Z	-1.425
Asymp. Sig. (2-tailed)	.154
Exact Sig. [2*(1-tailed Sig.)]	.208[a]

a. Not corrected for ties.

b. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
HYPERFOCUS	40	4.4500	.90441	1.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
HYPERFOCUS	4.0000	5.0000	5.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
HYPERFOCUS	1.00	26	19.23	500.00
	2.00	14	22.86	320.00
	Total	40		

Test Statistics[b]

	HYPERFOCUS
Mann-Whitney U	149.000
Wilcoxon W	500.000
Z	-1.091
Asymp. Sig. (2-tailed)	.275
Exact Sig. [2*(1-tailed Sig.)]	.361[a]

a. Not corrected for ties.

b. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QSIXTEENONE	40	3.4250	1.05945	1.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QSIXTEENONE	3.0000	3.5000	4.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QSIXTEENONE	1.00	26	17.58	457.00
	2.00	14	25.93	363.00
	Total	40		

Test Statistics[b]

	QSIXTEENONE
Mann-Whitney U	106.000
Wilcoxon W	457.000
Z	-2.249
Asymp. Sig. (2-tailed)	.024
Exact Sig. [2*(1-tailed Sig.)]	.031[a]

a. Not corrected for ties.

b. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QSIXTEENTWO	40	3.9250	.79703	2.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QSIXTEENTWO	3.0000	4.0000	4.7500
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QSIXTEENTWO	1.00	26	18.92	492.00
	2.00	14	23.43	328.00
	Total	40		

Test Statistics[b]

	QSIXTEENTWO
Mann-Whitney U	141.000
Wilcoxon W	492.000
Z	-1.244
Asymp. Sig. (2-tailed)	.213
Exact Sig. [2*(1-tailed Sig.)]	.254[a]

a. Not corrected for ties.

b. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QSIXTEENTHREE	35	3.4571	.91853	1.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QSIXTEENTHREE	3.0000	3.0000	4.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QSIXTEENTHREE	1.00	21	14.79	310.50
	2.00	14	22.82	319.50
	Total	35		

Test Statistics[b]

	QSIXTEENTHREE
Mann-Whitney U	79.500
Wilcoxon W	310.500
Z	-2.451
Asymp. Sig. (2-tailed)	.014
Exact Sig. [2*(1-tailed Sig.)]	.022[a]

a. Not corrected for ties.

b. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QSIXTEENEIGHT	40	3.3750	1.16987	.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QSIXTEENEIGHT	2.2500	4.0000	4.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QSIXTEENEIGHT	1.00	26	17.63	458.50
	2.00	14	25.82	361.50
	Total	40		

Test Statistics[b]

	QSIXTEENEIGHT
Mann-Whitney U	107.500
Wilcoxon W	458.500
Z	-2.234
Asymp. Sig. (2-tailed)	.025
Exact Sig. [2*(1-tailed Sig.)]	.033[a]

a. Not corrected for ties.

b. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QSEVENTEENONE	37	3.4324	.98715	1.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QSEVENTEENONE	3.0000	3.0000	4.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QSEVENTEENONE	1.00	24	17.00	408.00
	2.00	13	22.69	295.00
	Total	37		

Test Statistics[b]

	QSEVENTEENONE
Mann-Whitney U	108.000
Wilcoxon W	408.000
Z	-1.602
Asymp. Sig. (2-tailed)	.109
Exact Sig. [2*(1-tailed Sig.)]	.132[a]

a. Not corrected for ties.

b. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QSEVENTEENTWO	39	3.3846	1.01607	1.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QSEVENTEENTWO	2.0000	4.0000	4.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QSEVENTEENTWO	1.00	25	18.78	469.50
	2.00	14	22.18	310.50
	Total	39		

Test Statistics[b]

	QSEVENTEENTWO
Mann-Whitney U	144.500
Wilcoxon W	469.500
Z	-.969
Asymp. Sig. (2-tailed)	.333
Exact Sig. [2*(1-tailed Sig.)]	.377[a]

a. Not corrected for ties.

b. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QSEVENTEENTHREE	38	3.6053	.97369	1.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QSEVENTEENTHREE	3.0000	4.0000	4.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QSEVENTEENTHREE	1.00	24	17.21	413.00
	2.00	14	23.43	328.00
	Total	38		

Test Statistics[b]

	QSEVENTEENTHREE
Mann-Whitney U	113.000
Wilcoxon W	413.000
Z	-1.766
Asymp. Sig. (2-tailed)	.077
Exact Sig. [2*(1-tailed Sig.)]	.100[a]

a. Not corrected for ties.

b. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QSEVENTEENFOUR	39	3.6923	1.00404	1.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QSEVENTEENFOUR	3.0000	4.0000	4.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QSEVENTEENFOUR	1.00	25	16.86	421.50
	2.00	14	25.61	358.50
	Total	39		

Test Statistics[b]

	QSEVENTEENFOUR
Mann-Whitney U	96.500
Wilcoxon W	421.500
Z	-2.428
Asymp. Sig. (2-tailed)	.015
Exact Sig. [2*(1-tailed Sig.)]	.020[a]

a. Not corrected for ties.

b. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QSEVENTEENFIVE	39	3.5385	1.02202	1.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QSEVENTEENFIVE	3.0000	4.0000	4.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QSEVENTEENFIVE	1.00	25	17.14	428.50
	2.00	14	25.11	351.50
	Total	39		

Test Statistics[b]

	QSEVENTEENFIVE
Mann-Whitney U	103.500
Wilcoxon W	428.500
Z	-2.206
Asymp. Sig. (2-tailed)	.027
Exact Sig. [2*(1-tailed Sig.)]	.035[a]

a. Not corrected for ties.

b. Grouping Variable: STATUS-2

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
QSEVENTEENSIX	38	3.6842	.93304	1.00	5.00
STATUS-2	52	1.4231	.49887	1.00	2.00

Descriptive Statistics

	Percentiles		
	25th	50th (Median)	75th
QSEVENTEENSIX	3.0000	4.0000	4.0000
STATUS-2	1.0000	1.0000	2.0000

Mann-Whitney Test

Ranks

	STATUS-2	N	Mean Rank	Sum of Ranks
QSEVENTEENSIX	1.00	24	17.13	411.00
	2.00	14	23.57	330.00
	Total	38		

Test Statistics[b]

	QSEVENTEENSIX
Mann-Whitney U	111.000
Wilcoxon W	411.000
Z	-1.862
Asymp. Sig. (2-tailed)	.063
Exact Sig. [2*(1-tailed Sig.)]	.087[a]

a. Not corrected for ties.

b. Grouping Variable: STATUS-2

Appendix (F): Ethic Form

Brunel
UNIVERSITY
LONDON

Brunel Business School
Research Ethics
Participant Consent Form

Many thanks for agreeing to participate in my research project. The project has to be completed in part fulfilment of my degree programme and so your assistance is much appreciated.

Consent:
I have read the Participation Information Sheet and hereby indicate my agreement to participate in the study and for the data to be used as specified.

Name of participant or informed third party:

Signature: N. Shah

Date: 20/12/12

Appendix (G): Glossary

Aetiology: The philosophy and study of causation (Non-medical aspect)

Attention Deficit Hyperactivity Disorder: Neurobehavioral disorder, developmental disorder, and similar to hyperkinetic disorder

Brain Damage Disorder: Inattentive and restlessness and over aroused behavior

Conduct Disorder: Behavioural problems where a child is aggressive, antisocial

Developmental Disorder: Psychiatric conditions originating in childhood (ADHD)

Executive function: Cognitive processes (i.e. working memory, attention, verbal reasoning, planning, mental flexibility)

Hyperkinetic Disorder: Overactive restlessness, similar to hyperactive

Intervention: Educational strategies, treatments

Pedagogy: The science of learning, teaching methods, and Instructional design

Special Educational Needs: Learning difficulties

Working Memory: Mind system that can actively hold and recall information, including two forms of short-term and long-term memory