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Intervention through metacognitive development: A case study of a student with dyslexia and comorbid attention deficit disorder (ADD)

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Metacognition can be defined as taking control of and directing one's own thinking processes, and being aware of one's own cognitive strengths and limitations. It is the ability to understand, monitor and self-regulate cognition and is inseparable from intellectual functioning and learning. An important aspect of metacognition is the ability to show reflective awareness about the self, and knowledge in tandem with conscious monitoring during learning. Students with dyslexia and with associated learning disabilities appear to lack these metacognitive skills, which can be seen as a critical aspect of cognition. Metacognition is a bridge between areas and reflects all aspects of cognitive processing. An approach to metacognition within the framework of literacy development is presented through the case study of a 17 year old adolescent who has dyslexia with the co-morbidity of an attention deficit disorder (ADD). This paper illustrates the effectiveness of metacognition in general cognitive processing. The cyclic relationship between the two processes, namely cognition and metacognition is illustrated and the reciprocal nature of these two processes is emphasized. The objective is to show that the development of metacognitive awareness is an important tool in intervention for dyslexic and/or learning-disabled students and provides a case for general recognition of its importance in cognitive intervention. As metacognition is complex, the development of self-awareness is the focus of this qualitative study. The student's name has been altered to maintain confidentiality but the specific data on his learning disabilities and his progress in learning have been accurately reported.

Key words: Cognitive intervention, dyslexia, attention deficit/hyperactivity disorder (ADHD), metacognition, self-awareness.

INTRODUCTION

There are, unfortunately, many adolescents who are not succeeding in school. Many have been diagnosed as having dyslexia, a reading disability, some have been assessed as being unable to sit still and concentrate; others still cannot process the material in class. All can be called, 'struggling adolescent learners' (Lenski and Lewis, 2008). How to address the needs of these learners, many of whom cannot read fluently remains 'one of the most complex problems in education today' (ibid: 1). These adolescents have built up a self-image of failure. This is noticeable, even in children as young as five, but it is a particular problem with older children whose awareness of their lack of success is intensified by the advent of puberty and other teenage anxieties.

A history of failure can be self-perpetuating; lack of success causes children to make excuses, not to try in class, to avoid doing homework and, when older, to skip classes or to lie about what they have been doing. The underlying and prevailing attitude is "If I put in a lot of effort and work hard and then I am unable to answer a question in the classroom, or I fail to complete a project or I do poorly in an examination, then I will feel inadequate and unhappy. So why bother?" This negative attitude soon leads to the self-justification of "If I do not prepare for a test or I do not listen in class or apply myself in any way, then I am vindicated. I didn't try, I couldn't be bothered, and that is why I failed" (Ellis and Larkin, 1998). This pattern of 'learned helplessness'

becomes ingrained in the personality of such adolescents and creates a self-image of being a misfit within the academic setting (Williams et al., 2001). This pattern of behaviour can cause a child to drop out of school or to become a habitual truant. Other negative characteristics that can surface in this kind of adolescent are loneliness, an inability to make friends and a lack of social skills. Years of failure have instilled within them a perceived inadequacy and an apparent lack of skills compared with their contemporaries; meeting the goals of the academic setting can lower the adolescents' self-respect to the point where they 'erase' their 'self' (Goldfus, 2007; Williams et al., 2001; Burden, 2005).

Being able to 'break the cycle of failure' is the focus of this paper through the development of metacognition. The underlying premise presupposes that rebuilding positive self-esteem underlies effective cognitive intervention in all students, particularly those adolescents with learning disabilities, such as dyslexia, and the development of self-awareness, self-control and self-regulation, aspects of the theoretical construct, 'metacognition', provide the necessary foundation required to bring about change (Butler, 1998; Goldfus, 2007).

This premise will be discussed through a longitudinal study of a seventeen year old adolescent student in the mainstream.

Overall, this study provides initial data aimed at researching the processes involved in effective learning thus being able to provide successful intervention. As intervention is an extremely complex process, involving many different processes, this paper focuses only on the development of 'self' as essential for helping the adolescents to help themselves. Intervention cannot begin before the struggling adolescents have learned to understand and accept who they are, what their strengths and difficulties are, and how they can work to succeed within their educational setting (Williams et al., 2001). The goal is to turn failure into success. Research on neuroscience has shown how critical the 'emotional brain' is to successful learning (LeDoux, 2000, 2002; Hinton et al., 2008).

The paper consists of five sections namely, (1) a description of the subject and his background; (2) the theoretical underpinnings of the intervention study so as to provide the necessary academic background; (3) a brief analysis of his diagnostic assessment; (4) the intervention that was used in this case over an eighteen month period and the results; and finally (5) a discussion of the results of the intervention and the implications of this intervention.

RESEARCH PROCEDURES

This study was conducted as a qualitative case study because this methodology concentrated on gaining in-depth understanding and insights into the learning process. According to Stake (1995, 2005)

this method of research presents the complexity of the single case and attempts to tease apart the phenomenon being studied. The case study "seeks to understand a larger phenomenon through close examination of a specific case and therefore focus on the particular" (Rossman and Rallis, 1998: 70).

The intervention took place over a period of 18 months. Lessons took place every week for 60 min. Three face-to-face in depth interviews were conducted, at the beginning, in the middle and at the end. These interviews were taped. Permission to use the material, record and document the case study's progress was obtained from the parents and the adolescent.

Case study

Research participant

This article reports on a longitudinal study of a 17 year old adolescent student. A.K. was an interesting subject because he displayed the typical characteristics of an adolescent with dyslexia and a comorbidity of attention deficit disorder without hyperactivity. His inability to concentrate, to sit still, being constantly distracted by other children in the classroom, his low self-esteem, poor self-regulatory and organizational ability, compounded with failure at school and a lack of motivation drew important cognitive concepts into a focus which could be examined. In addition, he suffered from obesity.

There were no prior interventions, possibly because A.K. did not present as a behavior problem. His teachers thought that he was lazy. In an academic household, his parents could not accept his lack of success. A.K., the middle child with an older and younger sister, both of whom are academically successful and good looking, was faced with a situation which caused A.K. to threaten to leave school.

Educational assessment

A.K. underwent a battery of normed tests (Shany, et al., 2006) which tested his auditory processing, visual processing, discrimination, retrieval, auditory and visual memory, verbal and non-verbal tasks. For example, the battery included the rapid automatized naming test (RAN), phonological awareness, segmentation, and manipulation of phonemes, word identification, nonsense words and morpho-syntactic awareness, as well as tests which tested his decoding and reading comprehension to assess whether he had dyslexia. In order to test for attention deficit disorder (ADD), he was also administered the T.O.V. A. (Test of Variables of Attention). He also did a criterion-referenced test, the MEM (Glanz, 1974), which is normed and tests verbal abstract thought and verbal intelligence. This test assesses higher-order processes of the adolescents and draws up a profile of strengths and weaknesses in formal verbal knowledge. It assesses the ability of adolescents to cope with the demands of academic tasks, where the processes of inference, abstract thought and the ability to draw conclusions are needed. This test is able to provide a baseline of language proficiency and cognitive thought processes. It is also used as a diagnostic tool for the assessment of verbal ability as well as the ability to manipulate information.

FINDINGS

The results showed a profile of an adolescent with dyslexia. His assessment showed difficulties in

phonology, naming retrieval and language awareness. Further disabilities were found in perception and morphology, all components that cause problems with reading and writing. The tests pointed to severe difficulty in phonemic blending although he did not have any difficulty with segmentation.

The verbal intelligence test showed that the general thought processing ability was average and within the norm for his age. His ability for abstraction was within the norm but there was a difficulty in his ability to discriminate between main information and supporting details.

To sum up, his problems were specifically language-related, including difficulties in working and long-term memory. The findings of the T.O.V.A revealed a student with an attention deficit disorder. The results indicated a short-attention span and cognitive impulsivity. These results showed that A.K.'s failure was due to dyslexia with the comorbidity of an attention deficit (ADD).

Understanding dyslexia

When applying the metacognitive process to students with dyslexic characteristics, it is important to analyze the underlying causation. There are some broad categorizations of the underlying causation of dyslexia. The dyslexic person's disability may lie in auditory perception; giving the correct sounds to letters and digraphs, and/or visual perception; the recognition and recall of letters. Added to this there are the requirements of sequencing and orientation; arranging letters in the correct order when reading and subsequently when writing a word, and having most of the letters face a particular way. The adolescent with learning disabilities displays problems with memory including short-term, working and long-term memory. These memory-related problems exacerbate the inability to function efficiently in the classroom. A particular problem that arises with the adolescent learner is when the academic level demands processing, absorbing and recalling a large volume of information. The consequences of failure cause the learners to become inactive, which further results in an impoverished knowledge base. Lack of motivation leads to reduced effort, feelings of inadequacy and finally low self-esteem. The students who have a history of failure to avoid the learning situation have "learned" that they will probably be unsuccessful.

Understanding ADD/ADHD

In many cases people with dyslexia have comorbidity with other learning disabilities. There are some particular characteristics of adolescents with ADD/ADHD. They can be emotionally immature compared with their same-age peers; they show poor performance academic work, avoid assignments and display careless work, and poor

writing. These adolescents procrastinate and, after having started a task, are readily distracted or have difficulty tracking and completing their projects, especially when the task requires a good deal of time and effort. These cognitive impairments become increasingly problematic during adolescence and may have widespread effects that often seem like behavioral problems rather than being recognized as part of the ADHD syndrome. In many cases, the students who suffer from ADHD experience too much information, rather than too little, as a result of problems with the amount of sensory information entering the brain. Too much information can be a contributing factor to the impulsiveness displayed by this population of learners.

THEORETICAL BACKGROUND

Metacognition

Metacognition, the ability to understand, monitor and self-regulate cognition has been regarded as a key factor in understanding learning and reading comprehension in students with a learning disability (Wong, 1991; Butler, 1998; Perfect and Schwartz, 2002; Sodian and Frith, 2008; Schneider, 2008). Furthermore, metacognition has been considered to be an important construct in reading research (Brown, 1980; Baker and Brown, 1984; Ehrlich, 1996). The relevance of metacognition to learning disabilities can be realized through the conceptualization of the role metacognition plays in the successful processing of information and in literacy acquisition. John Flavell was the first to introduce the term of metacognition, in the context of memory research in the early 1970's based on the term "metamemory", and the first to recognize the importance of metacognitive knowledge to student's strategic approaches to learning tasks (Butler, 1998; Noushad, 2008; Schneider, 2008). Since his introduction of the term, many researchers have used metacognition and specified different definitions of the term to explain the problems that students have in coordinating their knowledge and processes while engaged in learning tasks. Ann Brown (1980, 1984) and her colleagues have extended the applications of metacognition to specific domains as reading and mathematics in the past couple of decades (Butler, 1998). Consequently, metacognition has become a central concept in educational research.

In brief, the growing interest in metacognition has developed mainly to explain problems in strategic performance, and is also related to the rise in interest in cognitive theories of learning (Butler, 1998; Noushad, 2008). Researchers have been trying to define the concept and use it to promote learning ever since it has been introduced. Researchers in different fields also used different concepts to describe similar phenomena, as will be elaborated further.

Definitions, components and related concepts

Metacognition involves knowing how to reflect and analyze thoughts, and how to draw conclusions from the analysis and to put what has been learned into practice (Noushad, 2008). Metacognition involves both knowledge about and control over thinking processes (Nelson and Narens, 1994; Noushad, 2008). In other words, metacognition is people's ability to combine their knowledge about their own information processing abilities, about task requirements and about strategies, and self-regulate their approaches to learning as a result of this combined knowledge (Butler, 1998; Noushad, 2008; Schneider, 2008). Also, it is students' ability to oversee their activities and use self-monitoring to promote successful activities and change unsuccessful ones.

There are three key constructs that are included in early definitions and classic models of metacognition: metacognitive knowledge (a declarative component), metacognitive processes or regulation (a procedural component), and the awareness and conscious reflection on knowledge or learning processes (Butler, 1998; Noushad, 2008; Schneider, 2008).

Metacognitive knowledge is students' knowledge about their own cognitive processes and products. Flavell identified three types of metacognitive knowledge: knowledge of person variables, task variables and strategy variables (Butler, 1998; Livingston, 1997; Van Krayenoord, 2010). Knowledge of person variables includes one's understanding about human beings as learners. Students know what their strengths and weaknesses are as learners, based on their previous experiences and beliefs. Their knowledge can be intra-individual (knowledge regarding themselves), inter-individual (knowledge regarding themselves in relation to others), or universal (beliefs about the abilities of all learners). Knowledge about task variables includes one's understanding about relationships between task characteristics and associated processing demands. Knowledge about strategy variables includes knowledge about different cognitive procedures that can help the student accomplish a certain learning task. Students also have to know how, when and where it is appropriate to use these strategies period Students' metacognitive knowledge influences their approaches towards different tasks and to learning in general (Butler, 1998).

Metacognitive processes are used to self-regulate, monitor and control students' approaches to tasks and cognitive processes during learning. They are also used to ensure that a cognitive goal has been met (Butler, 1998). Cognitive processes are used to help learners achieve specific goals. There is some similarity between cognitive and metacognitive strategies. Some processes can be regarded as both cognitive and metacognitive, depending on the purpose they are supposed to obtain. To identify metacognitive processes, we have to pay

attention to the function that a specific activity serves in a particular context (Butler, 1998; Noushad, 2008). Metacognitive processes usually precede or follow a cognitive activity and they often occur when cognitions fail.

Awareness or conscious reflection is a metacognitive activity of judgments of the product of a learning experience (Noushad, 2008). These judgments provide feedback to the learner on the selection and use of strategies leading to the refinement of one's metacognitive knowledge. There is a debate concerning the role of this third key construct of metacognition (van Krayenoord, 2010; Zimmerman, 2002). Most researchers have identified as metacognitive a range of knowledge and activities that require conscious awareness. However, researchers also acknowledge that children and students sometimes use self-regulation and cognitive processes outside of conscious awareness, particularly when problems are familiar and the appropriate processes are routine. Usually, awareness and self-regulation occur when students encounter obstacles, as in cases when comprehension breaks down during reading, or new problems (Butler, 1998).

The aforementioned components of metacognition have been very useful in explaining many of the performance failures experienced by students with academic difficulties. Nevertheless, new and expanded models have emerged in the last few decades, based on the understanding that metacognitive knowledge or regulation is not sufficient to promote students' achievement. Students must also be motivated to use their metacognitive skills (Butler, 1998; Noushad, 2008; Schneider, 2008). Newer models included additional metacognitive processes such as motivational beliefs, which energize students to act in goal oriented behaviors, and volitional processes, which are cognitive processes that are related to one's own "will power" and that students use while committing to a particular course of action.

Motivational beliefs are shaped by student's successive experiences with learning tasks (Butler, 1998). Two types of motivational beliefs, which influence self-regulation, are: self-efficacy and attributional beliefs (Burden, 2005). Self-efficacy refers to students' beliefs about their capabilities to learn or perform skills at different levels (Butler, 1998; Harris et al., 2004). Studies show that students with high self-efficacy display better-quality learning strategies (Kurtz and Brokowsky in Noushad, 2008). Attributions are students' beliefs about the factors that are responsible for their learning outcomes (Butler, 1998). These motivational beliefs influence the way students construct their metacognitive knowledge, and specifically their intraindividual and interindividual knowledge, hence, influence students' strategic approaches to tasks (Butler, 1998).

Volitional processes are cognitive processes that affective learners use to sustain their strategic activities,

when different obstacles interfere with their learning process. These processes are basically used to protect and direct learning activities for the purpose of achieving desired goals. Students who use these processes, and are aware of them, are able to regulate their learning and help themselves achieve goals. In fact, students' coordination of motivation, knowledge and skill is dependent on their ability to recognize threats to task engagement and utilize volition control strategies to sustain motivation and protect their focus on learning.

The concept of metacognition has continued to evolve over the past decade. According to new developments in neuroscience and educational research, several new and more complex models have been suggested. For instance, there are now even cognitive neuroscience models of metacognition (Shimamura in Schneider, 2008). In these complex models, new terms like self-regulation, self-monitoring and executive functioning, are included. These terms are sometimes used to describe some of the same basic phenomena and are often used interchangeably in the literature.

The term "self-regulation" or "self-control" was added in recent conceptualizations of metacognition (Schneider, 2008; Sodian and Frith, 2008). This term is used to describe the executive control of desires, beliefs, thoughts, and goals (Sodian and Frith, 2008). This self-control occurs when students make use of their metacognitive skills to direct their knowledge and thinking (Noushad, 2008; Schneider, 2008). It refers to central executive activities or functions and includes planning, directing and setting goals, and the evaluation of behavior, to optimize the use of cognitive resources. Self-regulated learning, therefore, encompasses thoughts, feelings, and actions generated by the student and then monitored and adapted over time in order to attain learning goals (Harris et al., 2004). Researchers have stated that self-regulation involves many processes that are integrated, like goal-setting, coding and storing information, monitoring and metacognition, managing time effectively, self-motivational beliefs and self-reflection (Boekaerts and Zimmerman as cited in Harris et al., 2004). Today, many researchers see self-regulation as a broader term than metacognition because it incorporates emotional, motivational, and behavioral monitoring (Harris et al., 2004). This term is more commonly used by educational and educational psychology researchers.

The concept of self-monitoring interacts with self-regulation, and is considered by researchers as a self-regulation technique (Harris et al., 2004; Schneider, 2008). Self-monitoring refers to keeping track of where a person is with a goal of understanding and remembering, or, in other words, evaluating how well a person is progressing (Schneider, 2008). Self-monitoring plays a central role in directing how people study. People use monitoring components such as ease of learning judgments and feeling of knowing judgments to decide

whether to continue studying.

The term "executive functioning" overlaps with metacognition and self-regulation (Harris et al., 2004). It is the cognitive control of behavior (Sodian and Frith, 2008) and it involves self-knowledge, including the representations of one's own goals and mental states. This term is more commonly used by cognitive neuropsychologists and psychologists (Harris et al., 2004). Executive functions are described as "the self-directed mental activities that occur during the delay in responding... actions we perform to ourselves and direct at ourselves so as to accomplish self-control, goal-directed behavior, and the maximization of future outcomes" (Barkley as cited in Harris et al., 2004).

Cognitive intervention

Intervention takes place within the framework of a cognitive processing model (Goldfus, 2001; Martin, 2009). This interdisciplinary model, based on the Nelson and Narens 1994 model from neuroscience and the Cornoldi (2010) model addresses executive functions which are essential components of learning and form the core of cognitive rehabilitation.

Intervention facilitates a change in cognitive functioning so as to produce changes in the way the learner relates to and copes with written material (Wharton-McDonald, 2011). In this context, metacognition is the ability to understand, monitor and self-regulate cognition. It is inseparable from intellectual functioning and learning. It is the ability to show reflective awareness about the self and knowledge in tandem with conscious monitoring during learning.

First there is an acceptance of the way the learner functions best. The next (what) is the understanding of the task, which would include an evaluation of knowledge (what I know), and the ability to undertake that task and succeed (how), procedural knowledge. The focal point at the beginning is to develop a positive self-image through self-awareness using the self-awareness scale (Goldfus, 2007). Being able to cope with the academic situation which causes so much fear and despair, enabled A.K. to take responsibility for his learning and begin to understand where he was in the learning situation (interpersonal).

Self-image continuum

Figure 1 shows a continuum from despair, learned helplessness to confidence and success. It promotes the self-image of the person with learning disabilities and the gradual development from a passive learner to an active and involved learner who is in control of the situation.

Once students internalize a positive self-image their sense of self-efficacy translates into self-statements such as "I can do it". Control of the situation enables them to

move on to the next stage (Goldfus, 2007).

The development of metacognition allows for a student to say *"I do not know how to do it" or "I cannot do this, can you explain this to me?* In other words, it acknowledges the fact that the inability to do something is not shameful, but part of the learning process. By being able to admit and acknowledge difficulties, the ability to self-regulate learning takes place and slowly the passive learner becomes personally involved in the learning situation, the frustration threshold rises and the desire to quit weakens. Concomitant with the aforementioned is an understanding of the limitations of the student himself. Metacognitive awareness development guides the student on how to assess himself realistically in relation to the different subjects at school.

Metacognitive knowledge thus emerges in tandem with developmental changes that permit students to see themselves as active, cognitive agents, to think about cognitive means and goals, to reflect on their cognitive processes and to participate in tasks like reading, that require self-regulation. The implication is that if one equates metacognition with students' ability to articulate their knowledge about learning, conscious awareness is a prerequisite (Butler, 1998). This training is the essence of cognitive intervention, namely, to break the cycle of failure.

Self-regulation

The question is why do students with learning disabilities fail to develop self-regulation? How have they become passive learners? The answer resides in the self-systems of students with learning disabilities. Self-system comprises self-efficacy, self-esteem and attributions (Wong, 1991; Goldfus, 2001; Burden, 2005). Students with learning disabilities and dyslexia have a history of academic failures (Torgesen, 2004). To turn students with learning disabilities into active learners involves "a direct assault on their mal-developed self-systems" (Wong, 1991: 250). How can this turnaround in their self-systems be achieved? First of all, these students must become responsible for their own learning. They then develop a sense of self-efficacy because through such training they take control of their learning and their lives. Self-efficacy develops confidence and executive control processes to monitor their learning, and so motivation follows. This translates into statements such as *"I can do it"*. Concomitant with the development of self-efficacy, self-worth rises as these students become successful in learning. This understanding of metacognition (Wong, 1991; Baker, 2008) is the core of cognitive intervention.

The aim of the metacognitive approach to cognitive intervention was to move the student from a state of despair and a spiral of failure and a passive learner state to someone who is active in the learning process and therefore has a sense of self.

This continuum of self-assessment is graphically illustrated in the following Figure 1: This continuum of self-awareness has developed from clinical work and intervention in adolescents and university students (Goldfus, 2007).

Within this continuum, self-control, self-monitoring and self-regulation are developed both through changing the individual's emotions in addition to involvement in the learning situation (intrapersonal). At first, just by beginning to cope with the academic situation which previously had caused so much fear and despair, a person is enabled to take responsibility for learning and begins to understand how to fit in to the learning situation (interpersonal). From the time that students internalize a positive self-image, their sense of self-efficacy translates into self-statements such as *"I can do it"*. Control of the situation enables them to move on to the next stage to the zone of proximal development where cognitive intervention can take place.

In terms of processing, students are presented with the categories as in Figure 1 and given explanations and asked to choose sentences that match their self-evaluation at that particular time. 'For example, *"I will never learn" or "I really do understand"*. They can also add their own phrases if they feel that their feelings are not being adequately expressed.

Success here enables the student to begin to feel that he can overcome his problems, that he is okay and involved and motivated. This positive stage in the process facilitates a state of active learning and a confident individual who is ready to at least attempt to overcome his problems and undertake the challenges that confront him.

Thus the process of the metacognitive training presented in this study is to break the cycle of failure. Being able to cope with the academic situation which causes so much fear and despair, enabled A.K. to take responsibility for his learning and begin to understand where he was in the learning situation (interpersonal).

The following diagram illustrates the various components of the theoretical construct of metacognition. To sum up, cognitive intervention takes place through developing metacognitive awareness. This approach enables the subject to understand his difficulties, draw up a profile of his strengths, and learn to relate to learning from an intra- and inter-personal perspective, namely, a process of self-awareness.

The next part of the article will illustrate how systematic training in the development of the 'self' can lead to 'cognitive rehabilitation'. The four pronged program from self-assessment, through self-awareness, the development of self-esteem, self-control and self-regulation, each addressing a different aspect of executive functioning, are key components to successful intervention in the at-risk adolescent students. The paper will show the changes through analysis of recordings of the comments of the subject as well as academic

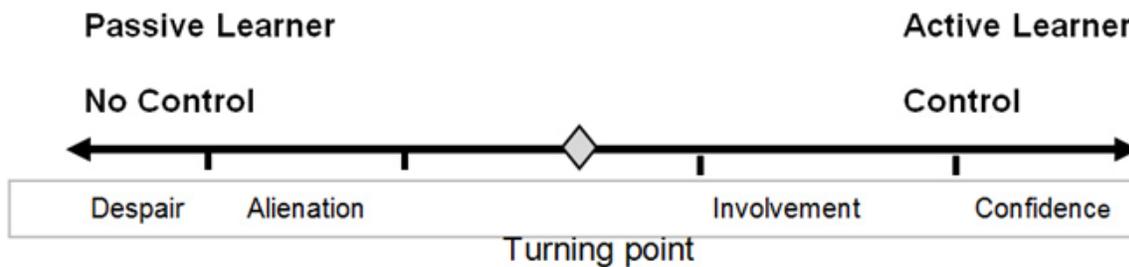


Figure 1. Continuum of self-assessment (Goldfus, 2001:130).

achievement in the classroom.

Intervention as a process

A.K. reported during my initial interview with him that he had difficulty in following the lessons.

"I am so slow. I never finish anything. Everyone else seems to manage to do things so easily. My mother says that I march to my own drum; my teachers think that I do not make enough effort."

He could not sit and listen for long periods of time; he always felt the need to get up and walk around in the lesson as sitting caused him to become nervous.

"I find it difficult to carry out more than one activity at a time and forget what I have to do."

"When I don't know what is going on, I get very nervous"

He also spoke of "disconnecting" when he could not cope. He doodled and many times left the classroom because he had no idea what was going on. He reported that he keeps erasing his work and starting from the beginning. He also expressed pain at his lack of confidence and his fear of authority. He mentioned several times that he tries to make himself as small as possible so that the teachers do not see him. Given his weight of over 100 kg., this comment illustrated how "small" and "insignificant" he felt as a result of his failure in school.

From the start an initial three-month trial basis 'contract' was negotiated with A.K., which obliged him to take on some responsibility, to be committed and to become an active partner in his rehabilitation.

Initially, he took a 2 min break, every 5 to 10 min since he seemed to be unable to sustain concentration for the full duration of the lesson. The intervention lasted for 18 months until he finished 12th grade.

When the intervention process commenced, his self-image was low and he was depressed.

"I know it and understand it in my head, but when I write it or say it, it does not come out correctly and I fail. I just never get anything right."

Self-efficacy

A.K. first had to understand what is meant by a learning disability and dyslexia in order for him to take control of his studies. He had to understand himself, with his strengths and weaknesses (the 'who' in Figure 2). In order to bolster a positive self-image, he was taught that all feelings are legitimate, even feelings of total despair (continuum of self-awareness, Figure 1). As soon as he was able to understand and accept his strengths and weaknesses an improvement in his studies was recorded.

The aim of intervention was to enable A.K. to take responsibility for his own studies (Wong 1991; Borkowski et al., 1989; Alexander et al., 1998; Butler, 1998; Larkin and Ellis, 1998; Schneider, 2008; Baker, 2008). A.K. first had to relate to the following:

1. Who am I?
2. What are my strengths and weaknesses?
3. Where do I fit in, in relation to the other students?

This was done through mind-mapping (Buzan, 1995).

Self-control

Within three months of intervention interviews with his teachers, his parents and A.K. himself testified to the fact that he was able to function more effectively in the classroom. This fact boosted his self-confidence and his willingness to undertake further steps in his cognitive rehabilitation. In his interviews, A.K. expressed the fact that he felt a great deal more positive about himself.

"I am aware of my problems."

"I am learning to cope with them."

"I am less frightened of authority.... actually that is quite

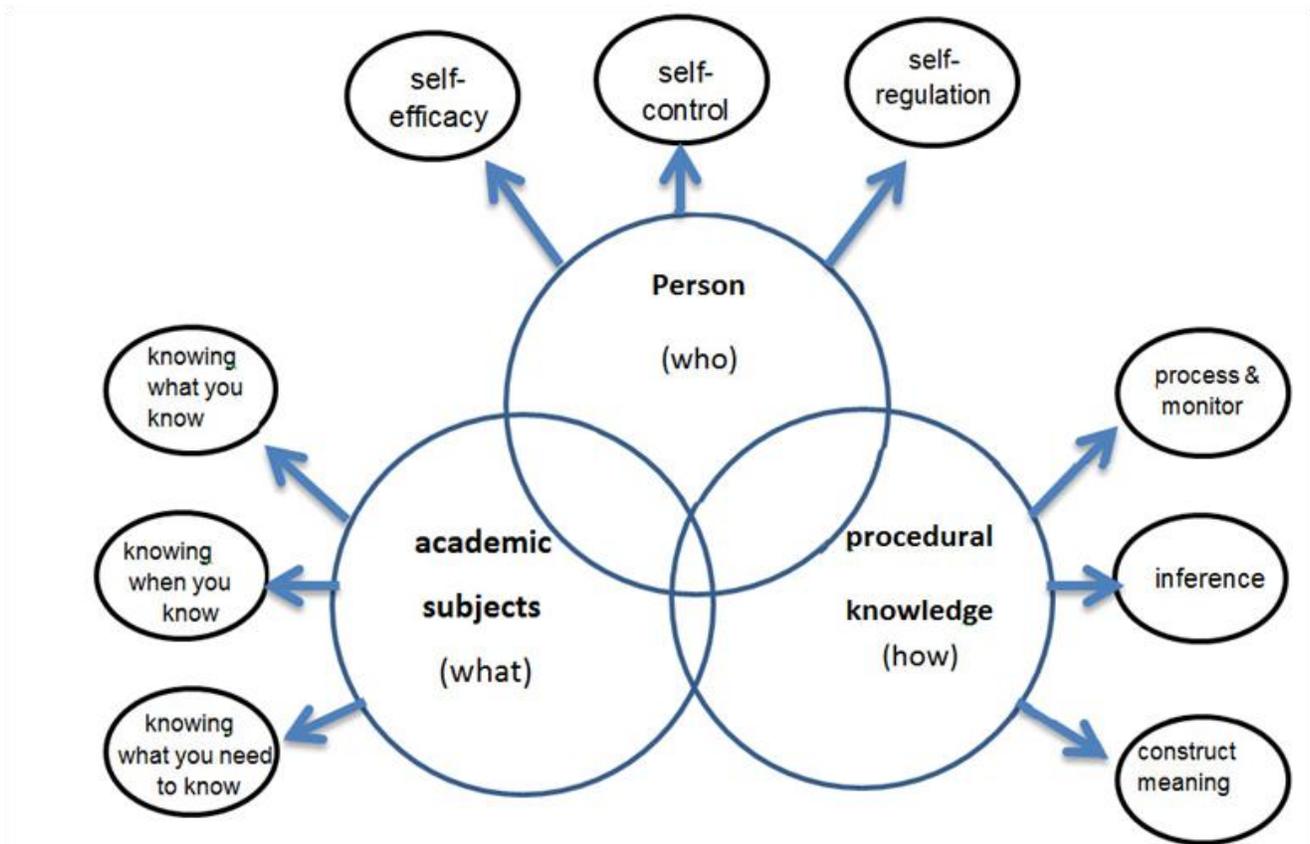


Figure 2. Components of metacognition (Goldfus, 2001:133).

*significant I don't feel like a mouse any more.
 "My self-esteem is a little bit higher but I have my moments when they go right down again."
 "I tackle my assignments."
 "My biggest achievement is that I understand when I run away and I try to stop myself."*

Self-evaluation (assessment)

Metacognition is the ability to monitor cognition (Flavell, 1976). In order to do this, the student has to learn to assess himself. This leads to the following questions:

1. How do you rate yourself?
2. What grade would you give yourself?

One of the characteristics of adolescents with learning disabilities is the inability to assess themselves correctly. They either overrate themselves and blame the teacher or they underrate themselves and feel that no matter how much effort they invest, they will always fail. Because he lacked an awareness of his own level of knowledge and expected the studies to be difficult and for him to fail, A.K.

showed how difficult it was for him to assess his progress accurately or remediate his performance failures (Baker and Brown, 1984; Baker, 2008). A.K. had to be taught how to

1. Use his time effectively in studying as well as in the examination.
2. Assess himself as to what he knows and what he does not know.
3. Read each question in the examination.
4. Scan difficult words.
5. Understand the main idea of the question and understand what was required of him.

The aim here is to learn to deal with failure, reevaluate the situation and find alternative ways to succeed. This aspect is critical in cognitive intervention of the adolescent dyslexic learner.

Metacognitive awareness in literacy acquisition

The focus of the intervention study reported here is on literacy acquisition, namely, being able to read long texts such as history and civics. In reading texts, A.K. did not

appear to recognize when he failed to understand what he was reading. He needed to be made aware of when this breakdown occurred. Thus, the next stage in metacognitive development is "knowing when you know" (Brown, 1980: 458). In addition, A.K. needed to confront, to understand and work out how to solve the problem. This involved him knowing *what he knew*, *what he did not know* and *what he had to know*. By being able to assess his partial knowledge, the student is able to identify the gaps and then ask for help (Baker, 2008). A major step forward for A.K. came when he was able to move from alienation on the self-assessment scale to the "turning point" which would subsequently enable him to progress through the stages from failure to success. This very intensive process involved encouraging A.K. to "externalize" his cognitive processing and thus to begin changing the "passive" learner into an "active" one (Torgesen, 2004).

An important step in this cognitive rehabilitation process was for A.K. to be aware of what facts he needed to know and to understand where he stood in relation to the material he had to learn. This eliminated his saying, "*I don't know anything*", or "*I am totally confused*", "*I'm going to fail*" and therefore giving up. He had to replace it with a process of monitoring what he understood and comprehending where his difficulties were focused. Through this metacognitive awareness and in parallel the development of procedural knowledge (how) which included the skills of re-reading and being able to construct coherent meaning in the texts A.K. began moving from the passive stage of desperation and helplessness to one of involvement and responsibility.

Metacognitive training in isolation does not automatically lead to enhanced learning. Thus, at the point where A.K. was able to understand and accept his difficulties, intervention could now focus very strongly on the academic subjects. At this point his difficulties in text processing were monitored. It was difficult for A.K. to focus his attention on the less well-mastered segments of material. His inability to understand the material globally and to be cognizant of what he had to accomplish led to more specific difficulties and at that point a blackout occurred and learning stopped. The issues that manifested themselves in reading long texts included a difficulty in being able to isolate the main ideas, select suitable retrieval cues and concentrate on the integration of earlier information.

Development of self-efficacy

The next stage of the metacognitive process needed to be the development of self-efficacy and intervention included intensive training on organizational skills. A.K. was taught to plan his time, to concentrate on the more important information and the construction of meaning (Baker, 2008). At the same time he was trained in the

tools for comprehension monitoring which defined that he had to stop when he was aware that he no longer understood what he was reading (Baker, 2008).

Once he had developed a certain level of automaticity, it was observed that he progressively gained in self-confidence and this showed how an appreciation of self, led to intrinsic motivation (Wong, 1986; Baker, 2008). At this point A.K. displayed enthusiasm and a will to succeed. He had broken through the 'turning point' barrier.

After six months of cognitive rehabilitation to address his dyslexic issues together with the metacognitive processes described previously, I observed that A.K.'s concentration increased, he tired less and he became more motivated. He was able to "chunk" and categorize information and his long-term memory improved as reflected in the quality and attainment of his schoolwork. He began to be able to carry out several activities simultaneously, something that had seemed to be unattainable at the beginning. In terms of the continuum of self-assessment, A.K. had progressed to the "confidence" stage and was taking control of his situation.

By the time he finished school, his recorded discussions showed that he had a more positive self-image, a belief in himself as well as an awareness of his strengths and his weaknesses. Asked about his disabilities, he answered that he was aware of what it meant to have learning disabilities and through the development of metacognition he was able to achieve his own goals as well as cope with most of the external ones. If he failed, he felt that he could monitor why he had failed. At the end of 18 months of intervention A.K.'s comments were:

"The biggest jump is the fact that I know what I have to do. I can break tasks down into their components and I know when I am telling stories or running away. I stop myself before I do that."

"I found that I am able to make a transfer from my lessons to my life in general."

"I will always suffer from a low self-esteem and I have to watch myself but I am not ashamed of my learning disabilities any more. I understand my strengths and I recognize my weaknesses."

"I can do lots of things that other people cannot. I am a good photographer and can develop that skill all my life."

"My biggest problem is my weight, we never dealt with it in the beginning but my breakthrough in this intervention program is that I am now able to talk to you about being overweight through my understanding of the awareness scale."

"You have given me the ability to face this problem and just as I have succeeded in passing my matriculation examinations I feel that I now have to take my weight problem as the focus and will now concentrate on this. I am beginning again at the beginning and this time I have hope."

DISCUSSION

Through the case study of A.K., the theoretical concept proposed by Flavell (1976) has been extended and enlarged upon in the cognitive rehabilitation and intervention of the adolescent student with a comorbidity of ADD and dyslexia.

This case study has shown that systematic training in the development of the "self" can be termed "cognitive rehabilitation". Successful cognitive rehabilitation breaks the cycle of failure, allowing the student to succeed in learning and to move from despair to confidence. The process of intervention and the impact of personal attention on a one-to-one basis over an 18 month period turned the situation around from failure to success.

With the underlying goal of restoring his emotional equilibrium and developing a belief in self and self-worth, A.K. was able to externalize and verbalize the problems within, to look at these problems objectively, to be able to confront them, to learn to reason and change the situation and to turn from being out of control into a situation of executive functioning.

"When I came to you at the beginning I had no self-confidence, I had no knowledge about my problems, I was extremely frightened of authority, I had never been able to complete any assignments and I fled from doing any work. I lied about what I was doing,running away was the way I dealt with everything."

A case has been made that the development of self-esteem, self-control and self-regulation, components of the theoretical construct, metacognition are the key components to help these 'struggling learners.'

Conclusion

This approach illustrated through the case study shows a process of learning rather than the product (Hinton et al., 2008). This way of developing metacognitive awareness can be applied to any subject within the academic field. This method applies research from neuroscience into the realm of education through the theoretical construct of metacognition.

This case study is innovative in that the emphasis is placed on developing 'the emotional brain', concentrating on the process and the awareness of 'self'. Motivation is emotionally-based. Through the metacognitive intervention, the student became intrinsically motivated by being provided with scaffolding throughout the learning process and promoting success. In a recorded interview with A.K.'s parents, his mother summed up the cognitive intervention process as follows:

"What you gave A.K. was a feeling of belief in himself. Once he had that belief, his whole attitude towards life,

school, and us changed. You gave him the motivation to learn."

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