Metacognitive Awareness and Performance on Assessment Tasks in Reading

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To the memory of my daughter,

Dana - you are part of all that is

Abstract

One of the most important issues in literacy education today is assessment. A great deal of literacy assessment takes place in our schools, and the amount of testing is increasing. Disappointment with literacy achievements and calls for greater accountability have been partly responsible for this increase as teachers, school officials, parents, policy makers and the public demand more information for judging the quality of literacy education (Farr, 1992).

In recognition of the need for significant changes in educational assessment practices, many educational systems throughout the world have adopted new types of assessment tools to examine the level of educational achievement. While there are differences across countries with respect to the nature of these tools and the way they are used, the common denominator is the tendency to reduce the use of multiple-choice questions in favour of more authentic and challenging open-ended questions (Glaser 1986; Glaser & Silver 1994; Mislevy, 1995).

While a great deal of effort has been made to ensure that these assessment tasks be authentic assignments evoking mental activities which are of social and intellectual significance also outside the classroom, little attention has been paid to learning processes and not enough consideration has been given to the valuable and beneficial findings of current research regarding learning, cognition, comprehension, meaning-construction, problem-solving, reading and writing. This research provides the knowledge base for deeper understanding of learners' learning processes, recent scientific data and other factors crucial to assessing pupils' performance, achievement and outcomes.

The challenge of this research is to provide a theoretical-practical framework that links assessment practice to learning theory - vital in this new era of alternative assessment. The theoretical framework of this research is rooted in three bodies of knowledge: Metacognitive Awareness theory, Schema theory and the Vygotskian 'Zone of Proximal Development'. With reference to this theoretical background, an experimental study was designed to test the effect of metacognitive awareness guidance on pupils' achievement and performance on three authentic reading assessment tasks taken from Israeli kits of assessment tasks (KATs). A total of 300 4th grade pupils participated in the research. The study utilised three modalities: The first was the control group, which received no treatment. The second was a placebo group that received content instruction guidance. The third group, the treatment group, was given written Meta Cognitive Awareness Guidance (MCAG).

Seven hypotheses, organised into three main clusters, were tested in this study:

The ***first cluster*** of hypotheses deals with the comparison of the three groups of the pupils participating in the research (e.g., 'between research groups').

The ***second cluster*** of hypotheses focuses solely on the treatment group. Its purpose is to examine the extent to which metacognitive awareness guidance affects pupils' achievement in the various sub-groups of the treatment group (e.g., 'Differences among sub-groups of the metacognitive awareness treatment group').

The ***third cluster*** examines pupil's answers to metacognitive awareness guidance questions and their teachers' views about the role and effects of metacognitive awareness guidance on learner performance and outcomes.

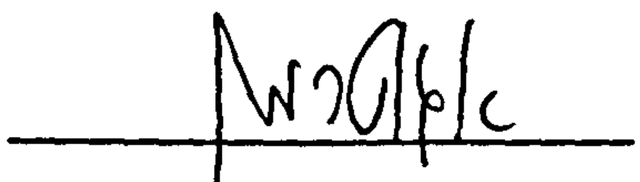
The findings are presented in three parts, in accordance with the three clusters of hypotheses described above. The findings confirm the central premise of this research: that learners who are given written metacognitive awareness guidance built on their prior knowledge, will exhibit a higher level of achievement on the tasks. The achievements of the subjects of the treatment group were compared to the achievements of learners of the control group who performed the same tasks without any support, and to the achievements of learners of the placebo group who received content instruction and read the text of the tasks before processing them, and were found to be significantly higher.

Furthermore, it was found that increasing learners' metacognitive awareness by integrating metacognitive learning principles into the reading assessment tasks not only facilitates their learning and improves its outcomes, but also increases their chances of internalising the guidance components and applying them in other learning activities. Learners' level of achievement was also examined in relation to other research variables: gender, school, level of awareness of metacognitive reading strategies, mental effort expenditure, and reported level of importance and effectiveness.

Significant implications arose from the qualitative findings obtained from teachers' interviews regarding teaching and the use of metacognitive awareness strategies in reading instruction and assessment. In light of the key findings, practical implications for reform in literacy assessment in general are discussed, in the hope that this will contribute in the new era of alternative assessment.

Declaration:

This work is original and has not been submitted previously in support of any degree qualification or course.



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At one magical instant in your early childhood, the page of a book - that string of confused alien ciphers - shivered into meaning. Words spoke to you, gave up their secrets; at that moment, whole universes opened, you became, irrevocably, a reader.

Alberto Manguels 1996

...to completely analyze what we do when we read would almost be the acme of a psychologist's dream for it would be to describe very many of the most intractable working of the human mind, as well as to unravel the tangled story of the most remarkable specific performance that civilization has learned in all its history.

E. B. Huey 1908

Preface: Metacognitive Awareness and Performance on Assessment Tasks in Reading

In recent years, many educational systems throughout the world have adopted new kinds of assessment tools to examine student achievement. While one may observe differences across countries with respect to the nature of these assessment tools and the way they are used, nevertheless, their common denominator is the tendency to reduce the use of multiple-choice items in favour of more authentic open-ended and challenging questions (Glaser & Silver 1994; Mislevy 1995).

In Israel, the Ministry of Education is currently involved in a major reform of educational assessment. Led by the Chief Scientist of the Ministry, two research teams were nominated, one at Tel-Aviv University and the other at the Centre of Educational Technology. Their mandate is to plan and develop Kits of Assessment Tasks (KATs) for the primary school (grades 1-6) and the middle school (grades 7-9) in major school subjects. The KATs represent one of two branches of a feedback system which focuses primarily on examining cognitive achievements.

Through a network of short, on-the-job training courses, teachers were taught to use the KATs and to obtain feedback on the achievement level of their pupils, without being obligated to report the results to others. The developers of the KATs regard implementation in the public educational system as a major step towards the post-modern era in the assessment of educational achievement. The KATs in reading will be further elaborated on in Chapter II.

Whereas a great deal of effort has been invested in ensuring that these assessment tasks be authentic and evoke mental operations of social and intellectual significance outside the classroom, less attention has been paid to metacognitive awareness, that is, guiding students in using valuable strategies designed to enhance reading comprehension while attempting assessment tasks.

This study utilises written metacognitive awareness guidance whose fundamental purpose is to raise learners' metacognitive awareness of their prior knowledge (schemata) before they begin to process their assessment tasks. This stems from my

expectation that increasing learners' metacognitive awareness by means of well-planned guidance based on prior knowledge, will not only facilitate their learning and improve the outcomes of assessment tasks, but will also increase their chances of internalising the guidance components and applying them in changing learning situations.

Before proceeding to elaborate on metacognitive awareness and its roles and functions in any kind of learning task, I would like to outline the development of research on reading. This will empower my research and strengthen the implications, relevant value meanings, and timing, especially in the context of the Israeli educational system. I will use the terms 'traditional view' and 'cognitive view' to illustrate and contrast the different perceptions of reading as reflected in reading research over the last 15 years.

Traditionally, reading has been described as a linear procedural routinised activity, and is viewed as the sequential mastery of basic skills. Based on Skinner's 'Behaviorism Instruction and Mastery Learning' model, it rests on the implicit belief that learning is linear and sequential, and that complex understanding can occur only by accretion of elemental prerequisite learning. In Skinner's (1954) words: "The whole process of becoming competent in any field must be divided into a very large number of very small steps, and reinforcement must be contingent upon the accomplishment of each step" (94).

The idea is to break the desired learning material into its constituted elements and to teach them one by one. Implications of this model for instruction are best conveyed by the metaphor of 'brick and wall', that is, it is not possible to lay the bricks in the fifth layer until the first, second, third, and fourth layers are completed.

The assumption of the 'Mastery Learning' model has had tremendous influence on reading comprehension instruction, on what ought to be taught, and on how to test and evaluate students' achievements and performance in reading. I will refer to five perspectives - notions that emerge from the Behaviourist theory - that have shaped and dominated the view on reading comprehension in Israeli schools:

1. The **reading curriculum** emerged from task-analytic behavioural conception of reading and focused on isolated reading skills arranged in a hierarchy of complexity

and difficulty developed by reading researchers and experts who share the understanding and belief that, as a complex skill, reading must be divided into a large number of sub-skills. The strategy is to develop hierarchies of learning objectives such that mastery of objectives lower in the hierarchy (simpler tasks) facilitates learning of higher objectives (more complex tasks), and the ability to perform higher-level tasks. This involves a process of task analysis in which specific behavioural components are identified and prerequisites for each are determined (Gagne 1962, 1968; Resnick, Wang & Kaplan 1973: 679). The order of objectives within each unit is based on detailed analyses of each task. These analyses are designed to reveal component and prerequisite behaviours for each terminal objective, both as a basis for sequencing the objectives and to provide suggestions for teaching a given objective to children who are experiencing difficulty (Resnick et al. 1973: 682). Smith (1965) documents how reading was viewed as a skill that could be divided into a component set of sub-skills involved in both decoding and comprehension. Examples of comprehension sub-skills included sequencing events, predicting outcomes, drawing conclusions, and finding the main idea. It was believed that reading could be improved by teaching students each of these necessary sub-skills to a minimal level of mastery (Harris & Smith 1972; Rosenshine 1980).

2. **Higher order skills** of reading occur late in the hierarchies and are not introduced to the learner-reader until after prerequisite skill have been mastered. The model assumes that component skills can be adequately defined and mastered independently and out of context. Only then are more advanced thinking skills acquired by "adding up" or assembling component abilities. According to Gagne (1970), "Thus it became possible to 'work back' from any given objective of learning to determine what the prerequisite learning must be - if necessary, all the way back to the chains and simple discriminations" (242).

3. **Reading skill**, in contrast to reading strategy within the cognitive view, is viewed as a set of highly routinised, automatic behaviours, and is associated with lower level thinking and learning. It is assumed that with repeated practice and drill, readers will automatically apply the skills they learn to whatever they read. There is no

place for intentional or conscious use of these skills; it is simply assumed that they will be used automatically or unconsciously.

4. In the traditional view, novice readers acquire a set of hierarchically ordered sub-skills that sequentially build toward comprehension ability. Once the skills have been mastered, readers are viewed as experts. **Expert readers** have been described as those who can master a discrete set of competencies or skills and, with little effort, automatically apply them when reading. In this view, readers are passive recipients of information in the text. Meaning resides in the text itself, and the goal of the reader is to reproduce that meaning.

5. **Assessment**, in accordance with the traditional view, should be closely allied with instruction. Tests should exactly specify desired behavioural outcomes of instruction and should be used at each learning juncture; that is, one should 'test–teach–test'. Tests should be keyed to essential skills, and feedback should be provided about how well students have mastered the desired objectives. For example, for testing reading comprehension, items would be broken down into fact or opinion, main idea, details, sequence, or generalisation. Since teachers would not see individual items, they would teach to these areas. The areas, in turn, are curriculum referenced, and there are support materials for all of them. Just as measurement gave answers that treated the test and the curriculum as being synonymous, and the test and learner objectives as being equivalent, therefore, teaching to tested objectives was synonymous with good instruction. This emerges from the behaviourist and programmed learning model that relies on two basic assumptions about the nature of tests. First it assumes that all important learning objectives can and will be specified and measured both completely and exhaustively, at least for instructional purposes.

At this point, I would like to draw upon some autobiographical facts that will put this research into a more personal context. Between the years 1982 and 1985, I was involved in a nation-wide project, led by the Ministry of Education and the Centre of Educational Technology, in reading instruction. The program was based on a 'skill and drill' practice theory, and reflected the behavioural approach which assumed that

literacy was taught through direct instruction of isolated skills organised hierarchically and mastered one level at a time (the '*TOAM*' Reading project).

The project was based on fourteen paths of reading skills, classified into sub-skills and keyed to specific grade levels. The pedagogical belief and expectations of this project were that if the learners practised and mastered all skills and sub-skills, they would master reading.

After three years of implementation, the Ministry of Education administered a reading comprehension test to evaluate the achievement of students involved in the project. Twenty-five percent of the students in grades four and five failed the reading comprehension test. The results astonished everybody: teachers, principals, parents, the educational establishment, policy makers and reading experts. Furthermore, they spurred a public debate which focused on responsibility and combined allegations and justifications, and led to three extreme conclusions:

1. Many students (25% of them) do not read because of low mental ability
2. Evaluators do not know what they are evaluating or how reading should be assessed, so the results are not relevant
3. Teachers, in general, are not performing their task

Since I was involved in the debate, I was left with a deep sense that the students possessed a higher level of reading comprehension than that actually demonstrated on the reading test, and that the real level of comprehension still had to be identified and proved by more appropriate and accurate assessment test. This feeling stimulated my academic studies. I started my master's research with a pilot study: I went to classes that had been part of the project described above, and asked the learners to answer one question:

"Your good friends are having difficulty trying to learn from reading. From your experience, give them some advice, and tell them what they can do to improve their understanding."

The answers were as follows (Guterman 1988):

70% suggested:	"they have to read carefully", or,
	"they have to read slowly", or,
	"they have to concentrate", or,
	"they have to pay more attention"
20% suggested:	"they have to start from easy readings"
20% suggested:	"they have to read more, and reread"
10% suggested:	"they have to take a course in fast reading"
10% suggested:	"they have to read aloud"

It was expected that pupils would use terminology and expressions stemming from the program and give answers like: "they have to locate a specific detail", "they have to identify the main idea", "they have to recognise the text structure", "they have to be sure they understand all the words", etc. In fact, the answers which were given were totally different. I decided to go back to the classes and ask the students about the suggestions they raised.

I sat with ten students and asked them to describe in their words what they really do when they "read carefully", or "read slowly" or "concentrate" or "pay attention". All of them suggested the same activities in different words: "they have to make sure they understand", "they should only read and not do anything else at the same time", "while reading, don't pay attention to others", etc.

It was very clear to me that they were not active from a cognitive point of view. I searched for the source of their suggestions and discovered that they actually repeated instructions given them by their teachers and tutors. Whenever a student had difficulty understanding, the teacher's usual response was "read carefully", or "read slowly" or "concentrate" or "pay attention". It was crystal clear to me that the program lacked some fundamental and essential links, the major one of which can be summarised in the words, "Think about what you are doing", instead of acting without awareness. Terms such as "planning", "checking", "recalling", "revising", "evaluating", "assuming", and others which represent the *language of thinking* (Perkins 1992) were not applied.

Considering the conclusions, observations, and implications which emerged from this long and extensive experience with the reading curriculum in schools in Israel, I found myself, again, returning to the basic questions of the nature of the reading comprehension process. This led me to thoroughly examine the cognitive view, as contrasted with the traditional view of reading.

The cognitive view of reading presents a different view from the traditional one of reading processes and a different view of the reader's role and function. It emphasises the interactive nature of reading (Rumelhart & Ortony 1977; Dole et al. 1991) and the constructive nature of comprehension (Anderson, Reynolds, Shallert & Goetz 1977; Rumelhart 1980; Spiro & Tierre 1980). All readers, both novices and experts, use their existing knowledge and a range of cues from the text and the situational context in which the reading occurs, to construct a model of meaning from the text. According to this view, even novice readers can behave like experts when presented with texts and tasks for which they possess appropriate knowledge. Conversely, even expert readers can be reduced to the level of novices when presented with obscure or ambiguous texts.

The knowledge that readers bring to the text is paramount (Anderson et al. 1977; Rumelhart & Ortony 1977; Spiro & Tierre 1980). What we typically call *prior knowledge* comes in many forms: (a) specific knowledge about the topic of the text; (b) general world knowledge about social relationships and causal structures; and (c) knowledge about text organisation (Resnick 1984). Add to that the levels of knowledge that students need about strategies (see, e.g., Paris, Lipson & Wixson 1983) and the concept of prior knowledge becomes quite complex. In particular, Paris et al. (1983) refer to *declarative* (What is the nature of this strategy?), *procedural* (how do I deploy it?) and *conditional* (when and why would I ever use it?) knowledge, as well.

At all levels of age and ability, readers use their existing knowledge as a filter to interpret and construct meaning in a given text (Anderson & Pearson 1984). They use this knowledge to determine importance (Afflerbach 1986), to draw inferences (Gordon & Pearson 1983; Hansen 1981; Hansen & Pearson 1983), to elaborate

(Hansen & Pearson 1983) and to monitor comprehension (Dewitz, Carr & Patberg 1987).

The traditional view of reading assumes a passive reader who has mastered a large number of sub-skills and automatically and routinely applies them to all texts. The cognitive view assumes an active reader who constructs meaning through the integration of existing and new knowledge and the flexible use of strategies to foster, monitor, regulate, and maintain comprehension.

To sum up, in addition to knowledge, expert readers possess a set of flexible, adaptable strategies that they use to make sense of the text and to monitor their understanding. They also possess a set of concepts about these strategies. A cognitive view of comprehension ascribes more credibility to reading strategies than to skill. Strategies are thought of as conscious and flexible plans which readers apply and adapt to a variety of texts and tasks. Strategies emphasise intentional and deliberate planning controlled by the reader. Good readers make decisions about which strategy to use, when to use it, and how to adapt it to a particular text. Strategies emphasise reasoning: readers use reasoning and critical thinking abilities as they construct and reconstruct evolving meaning from text. Strategies are inherently flexible and adaptable, readers modify strategies to fit different kinds of texts and different purposes. Thus, two important characteristics of readers - the knowledge that students bring to the text and the strategies that they use to foster and maintain understanding - play important roles in distinguishing between the traditional and the cognitive views of reading comprehension

Expert readers are aware of and in control of cognitive reading processes before, during, and after reading. Expert readers consciously engage in strategic reasoning when they access appropriate background knowledge to make initial predictions about text meaning. They consciously construct meaning by combining prior knowledge with new text information, monitor comprehension and modify initial predictions when necessary. When an obstacle to comprehension (e.g., an unknown word) is encountered, expert readers solve the problem by consciously selecting and applying 'fix up' strategies to repair comprehension blockages. Expert readers use reason to

determine the significance of what was read and what conclusions to draw and judgements to make about the content. In short, expert readers are metacognitive (Baker & Brown 1984a, 1984b; Barr et al. 1987; Flavell 1981). Strategies and knowledge imply "***Metacognitive Awareness***": good readers can reflect on what they are doing while they are reading (Baker & Brown 1984a). They are aware of whether they understand or do not understand, and this awareness usually leads to regulation and repair.

Metacognition has been defined as having knowledge, understanding and control over knowledge as well as the appropriate use of knowledge (Flavell 1976, 1979, 1981; Brown 1978, 1980, 1982a, 1982b; Bransford et al. 1980; Corkill & Koshida 1993). Thus it involves both conscious awareness and the conscious control of one's learning. Metacognitive awareness is a central, vital and necessary component of the learning, internalisation and transfer process (Brown et al. 1986; Guterman & Wohl 1994; Salomon, Globerson & Guterman 1989).

Flavell (1979) defined two foci at the metacognitive level: the focus of knowledge and awareness which learners have with reference to cognitive processes (knowledge and awareness of themselves as learners; knowledge and awareness of the task; knowledge and awareness of learning strategies), and the focus of control (planning, feedback, correction, follow-up, adaptation, supervision and control). Readers/learners who are not equipped with metacognitive knowledge cannot reflect on the cognitive processes taking place inside themselves and cannot be aware of their own activities; consequently, it is difficult to believe that such learners will be able to identify mistakes in the process of answering a given question, or take remedial action when encountering failure or misunderstanding. Several recent studies have shown that learners' metacognitive awareness of control, regulation and adaptation of their learning-understanding process is a good predictor of the level of their performance on scholastic tasks (Corkill & Koshida 1993; Swanson 1990).

Metacognitive awareness is an essential feature of the theoretical framework of this study. One of the main conclusions of the discussion in Chapter I is that when we talk about metacognitive awareness, we are actually referring to knowledge and knowing,

and about being aware of the knowledge in order to know. Thus knowledge, and the awareness of knowledge, will determine one's level of knowing.

Chapter I is devoted to exploring, describing, and analysing the following:

- Components of metacognition (p. 15-18)
- Research implications of metacognition (p. 18-20)
- Metacognition awareness and reading (p. 21-31)
- Metacognitive awareness - building bridges and making connections (p. 32-41)
- The role of the meta-reader - the successful reader (p. 42-47)

To establish the importance of prior knowledge[1] in the process of reading, comprehension, and understanding, I will use schema theory, based on the work of Anderson, Rumelhart, Bransford and Lipson, among others. Schema theory attempts to explain how knowledge is represented in the mind, and how that representation facilitates the use of knowledge (see below, p. 32-39). In accordance with schema theory, all knowledge is packed into units referred to as schemata. Each of these is a 'packet of knowledge' which includes (1) what one knows about a concept, subject or issue, and (2) how other, different kinds of information are related to that concept, subject or issue and (3) how this knowledge is to be used (Rumelhart 1980).

According to schema theory, comprehension is the use of prior knowledge (background knowledge) to create new knowledge. Without prior knowledge (which must be activated to be useful), written material would be meaningless. The more knowledge a reader can bring to a text, the more likely it is that the written material will be understood (Rumelhart 1980; Wilson & Anderson 1986). These researchers do not simply argue that the activation of appropriate prior knowledge is a useful thing to do, they assert that it is a fundamental aspect of the acts of comprehension, understanding, and performance.

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[1] Prior knowledge is defined in this research as the various kinds of information contained in learners' long-term memory which is required for constructing meaning from written text: linguistic knowledge, grammar knowledge, skill knowledge, strategy knowledge, textual knowledge, contextual knowledge, overall prior knowledge, specific prior knowledge, and world knowledge.

One clear implication of this view is that some learners may appear to have poor comprehension and understanding skills, not because they have some inherent comprehension or understanding 'deficits', but because they lack or fail to activate the prior knowledge that was presupposed by the message or the text. Clearly, there are many different levels at which a learner may lack the background knowledge necessary to understand a text. In Anderson's words, "What they don't know *will* hurt them" (Wilson & Anderson 1986: 31). This argument, as derived from schema theory, is a major guideline in this research.

The issue of activating one's schemata is crucial to the terms metacognition, meta-comprehension, meta-linguistics and metacognitive awareness. Basically, these terms assume that the reader is:

- aware that s/he has schemata in linguistic knowledge, grammar knowledge, strategy knowledge, textual knowledge, contextual knowledge, etc.
- aware that s/he can and needs to use these different kinds of prior knowledge in an attempt to learn and construct meaning.
- able to use this prior knowledge consciously.

A basic step in achieving metacognitive awareness is providing the student with guidance in metacognitive awareness – a metacognitive aid intended to raise learners' awareness of their prior knowledge and of the influence and impact of such knowledge on the process of understanding. Metacognitive guidance serves as a cognitive tool for self-regulation and mental representation of information, and allows the learner to perform on a higher cognitive level. The difference between what a learner can do alone and what he or she can do with appropriate guidance is called the 'zone of proximal development' (Vygotsky 1978). On the basis of Vygotsky's theory, Brown et al. (1990), Palincsar (1986) and Brown and Ferrara (1985) showed that guidance within the zone could result in improvement in reading, social studies, science, math, and listening skills. Chapter II of this research presents the principals, design, and components of the written Metacognitive Awareness Guidance (MCAG) developed and administered to the experimental group of learners in this study (see p. 55-60).

Now that we know more and understand better the complexity of reading comprehension processes, it is essential that the assessment process, methods and tools will reflect this knowledge. There is a consensus among researches that assessment of school literacy curriculum must reflect this development, and that it is no longer acceptable to administer a standardised reading test once or twice a year in order to monitor student's progress in reading and to believe this gives anything like an adequate picture of the student as a reader (Coles 1998; Harrison, Bailey & Foster 1998b; Pearson, Spalding & Myers 1998).

Various scholars have pointed out that reading assessment has not kept up with advanced reading research, knowledge of literacy development, or reading theory and practice; that reading assessment is insensitive to many theoretical and instructional developments in the field, and that assessment oversimplifies the complex set of behaviours that are integrated in reading (Squires 1987; Valencia & Pearson 1987; Edelsky & Harman 1988; Hodges 1989; Fair Test and NYPIRC 1990; Harman 1990). In Perkins' words, "We do not have a *knowledge* gap; we have a monumental *use of knowledge* gap" (Perkins 1992: 2). Still, most schools use standardised tests as the base on which they make judgements about students' reading abilities. These tests are either multiple choice, single correct-answer formats, word-level or sentence-level reading tests, which treat reading as a single-measure task.

In recognition of the need for significant changes in educational assessment practices, the Israeli Ministry of Education decided to introduce a change in assessing the standards of educational achievement in the elementary school (grades 1-6) and in the junior high school (grades 7-9). The Ministry is currently involved in a major reform of educational assessment, as described in special circular No 1995/6 of the General Director of the Ministry of Education and in Chapter II, "The KATs Collection" (p. 48-54), in this research.

I would like to conclude this introduction by mentioning ***timing***. This study takes place at the intersection of three very significant paths of development: development in reading theory and practice, development of new understanding and goals of student performance assessment, and the involvement of the Israeli Ministry of Education in

the reform of educational assessment by developing and promoting Kits of Assessment Tasks (KATs). I will examine these three paths of development and attempt to narrow the gaps between them. I will try to integrate new knowledge in reading theory and practice by adding written metacognitive awareness guidance to the Kits of Assessment Tasks.

I will end this introduction by expressing the hope that the results of this study will contribute to the new assessment era in Israel's educational system, and will make a difference in the evaluation of reading performance, because reading is the most fundamental skill needed for learning.

This research is organised into five chapters: the conceptual framework, the empirical framework, the findings, the discussion and conclusions, and the summary and recommendations. In the next chapter, the conceptual framework, I will describe the theoretical basis of this study with respect to three main bodies of knowledge and research: metacognitive awareness theory, schema theory, and the Vygotskian 'zone of proximal development'. These three fundamental theories of learning are used to observe, examine and analyse, as well as determine the essential features of the learner's 'job' while attempting to construct meaning, create knowledge, and learn from written text, and as a basis for Metacognitive Awareness Guidance instruction.

Chapter I: The Conceptual Framework

The Role of Metacognitive Awareness (MCA) in Learning

Cognition and Metacognition

Vygotsky (1962) describes two phases in the development of knowledge: initially, automatic unconscious acquisition, followed by a gradual increase in the active conscious control over knowledge. The distinction is essentially the difference between cognitive and metacognitive aspects of performance.

Cognition refers to the intellectual functioning of the human mind and is characterised by automatic information processing which requires little mental effort or conscious attention on the part of the learner, and little direct control and attention. It is a rapid, unconscious process.

Metacognition refers to one's knowledge, awareness, and control over this cognitive process. It is characterised by controlled information processing, requiring the learner to be aware of, and to invest mental effort, direct control and attention in learning. Thus it represents deliberate conscious control of one's own cognitive actions.

Cognition implies having the skills. Metacognition refers to awareness of, and conscious control over, those skills. The distinction is similar to one made by Brown (1978, 1980) between 'knowing', 'knowing how to know', and 'knowing about knowing'.

Miller, Golanter and Pribram (1960) proposed a relation between 'plans' and 'metaplans' that is similar to the distinction between cognition and metacognition. They suggested that learning occurs only when the person has some kind of a plan. Furthermore, a plan will not be achieved without "intent to learn, that is to say, without executing a metaplan for constructing that which will guide recall" (1960: 129). These metaplans generate alternative plans. Once a plan is available, a control process, referred to as a Test-Operate-Test-Exit (TOTE) unit, guides behaviour. This TOTE unit continually monitors the progress of the plan currently activated. It is believed that TOTE units and metaplans roughly correspond to the mechanisms of knowledge and

control used by mature readers, and that plans correspond to specific strategies which can be activated by higher order cognitive control processes.

Metacognitive Components

Flavell (1979) divides metacognitive activity into two categories:

- activities concerned with conscious reflection on one's cognitive abilities and processes
- activities concerned with self-regulation mechanisms during ongoing attempts to learn, read, write or solve problems.

The first category of metacognitive activity involves metacognitive knowledge, consisting primarily of knowledge or beliefs about what factors or variables act and interact, in ways that affect the course and outcome of cognitive enterprises. In this first category of metacognitive knowledge, Flavell delineates three major subcategories:

1. *Personal knowledge* - encompasses everything the student/learner knows and believes about him/herself and other students as a cognitive processor; a person's knowledge about his or her own cognitive resources and the compatibility between the person as a learner and the learning situation.

2. *Task knowledge* - concerns the information available to the student/learner during a cognitive enterprise; the knowledge and awareness of the knowledge about the components of the learning task (abundant or meagre, familiar or unfamiliar, well- or poorly-organised, interesting or dull, trustworthy or untrustworthy, etc.). Metacognitive task knowledge is familiarity with these variations, awareness of them in the process of learning, understanding what they imply, and knowing how the cognitive enterprise can best be managed, and how successful the learner is likely to be in achieving his/her goal.

3. *Strategy knowledge* - involves knowledge of whatever strategies are likely to be effective in achieving sub-goals and goals in any sort of cognitive activity undertaken. Flavell (1979) considers this knowledge to represent a very significant,

influential factor in the success or failure of the learner in every task, problem, or other cognitive activity.

The second category of metacognition, that of self-regulation, involves content-free strategies or procedural knowledge. It is used by an active learner during the on-going attempt to learn. These metacognitive activities include **checking** the outcome of an attempt to learn, **planning** one's next move, **monitoring** the effectiveness of an attempted action, and **testing, revising** and **evaluating** one's strategies for learning.

Brown (1978) refers to this category as an "executive control system" - a system capable of performing intelligent evaluations of its own operation, including the ability to:

One) predict the system's capacity
Two) be aware of the repertoire of heuristic routines and their appropriate domain utility
Three) identify and characterise the problem at hand
Four) plan a schedule with appropriate problem-solving strategies
Five) monitor and supervise the effectiveness of those routines it calls into service
Six) dynamically evaluate these operations in the face of success or failure so that termination of activities can be strategically timed (Brown 1978: 152).

Sternberg (1984) provides an alternate list of executive control processes which can be used in planning, monitoring, and evaluating one's information-processing skills. They are as follows: (a) deciding on the nature of the problem; (b) deciding on performance components relevant for solving it; (c) deciding how to strategically combine performance components; (d) selecting a mental representation of information; (e) allocating resources for problem-solution; (f) monitoring solution processes; and (g) being sensitive to external feedback.

To simplify the list of activities, Brown (1978) suggested to distinguish between three major activities:

One) *Planning* - Activities undertaken prior to problem-solving; tasks which predict outcomes, schedule strategies, and determine various forms of trial and error, etc.

Two) *Monitoring* - Activities during learning: testing, revising, rescheduling one's strategies for learning.

Three) *Checking* - Activities evaluating the outcome of any strategic action against the criteria of efficiency and effectiveness.

In Brown's (1978) and Sternberg's (1984) description and definition of metacognitive behaviour, the awareness component is not explicitly mentioned. However, they clearly assume that the awareness component is a substantial part of every metacognitive activity.

Haller, Child and Walberg (1988) summarised the essence of metacognition by describing three clusters of activities. In their division, the awareness component is one of the three clusters which characterises every metacognitive activity:

One) *awareness* (one's recognition of implicit or explicit information)

Two) *monitoring* (self-questioning and paraphrasing to stimulate understanding)

Three) *regulating* (composing and contracting more plausible solutions in problem-solving)

Flavell (1979) indicates one more type of metacognitive awareness which reveals important aspects of effective learning - **metacognitive experiences**. Metacognitive experiences refer to where you are in an enterprise and what sort of progress you are making, or are likely to make: you believe/feel that you have almost memorised those instructions, you are suddenly stymied in your attempt to understand something you are reading; you have just begun to solve what you sense will be an easy problem, and so forth. Metacognitive experiences are best described as items of metacognitive knowledge that have entered consciousness.

Metacognitive experiences can have a very important effect on cognitive goals or tasks, on metacognitive knowledge, and on cognitive actions or strategies. First, they can lead one to establish new goals and to revise or abandon old ones. Experiences of puzzlement or failure, for example, can have any of these effects. Second, metacognitive experiences can affect one's metacognitive knowledge base by adding to it, deleting from it, or revising it. One can observe relationships among goals, means, metacognitive experiences, and task outcomes.

A metacognitive experience occurs when a learner has an '*aha*!' feeling about cognition. Anderson (1980) describes metacognitive experience in reading as '*clicks*' (awareness of cognitive success, usually of understanding and remembering) and '*clunks*' (awareness of cognitive failure, usually of information confusion or forgetting). The '*aha*!' that something is wrong with a reading enterprise is as good as

the '*aha*!' that all is well. Only when readers detect problems can they adjust processing strategies, perhaps by re-reading a confusing portion of text, slowing down their pace, or consulting an external source for a key definition. According to a model of metacognitive components proposed by Flavell and other metacognitive theoreticians (see Figure 1), the monitoring of cognitive enterprises proceeds through the actions of, and interactions among, metacognitive knowledge, goals/tasks, and action/strategies. This model implies a dynamic interplay of interaction or combination among three types of metacognitive variables in any situation of learning and/or processing information.

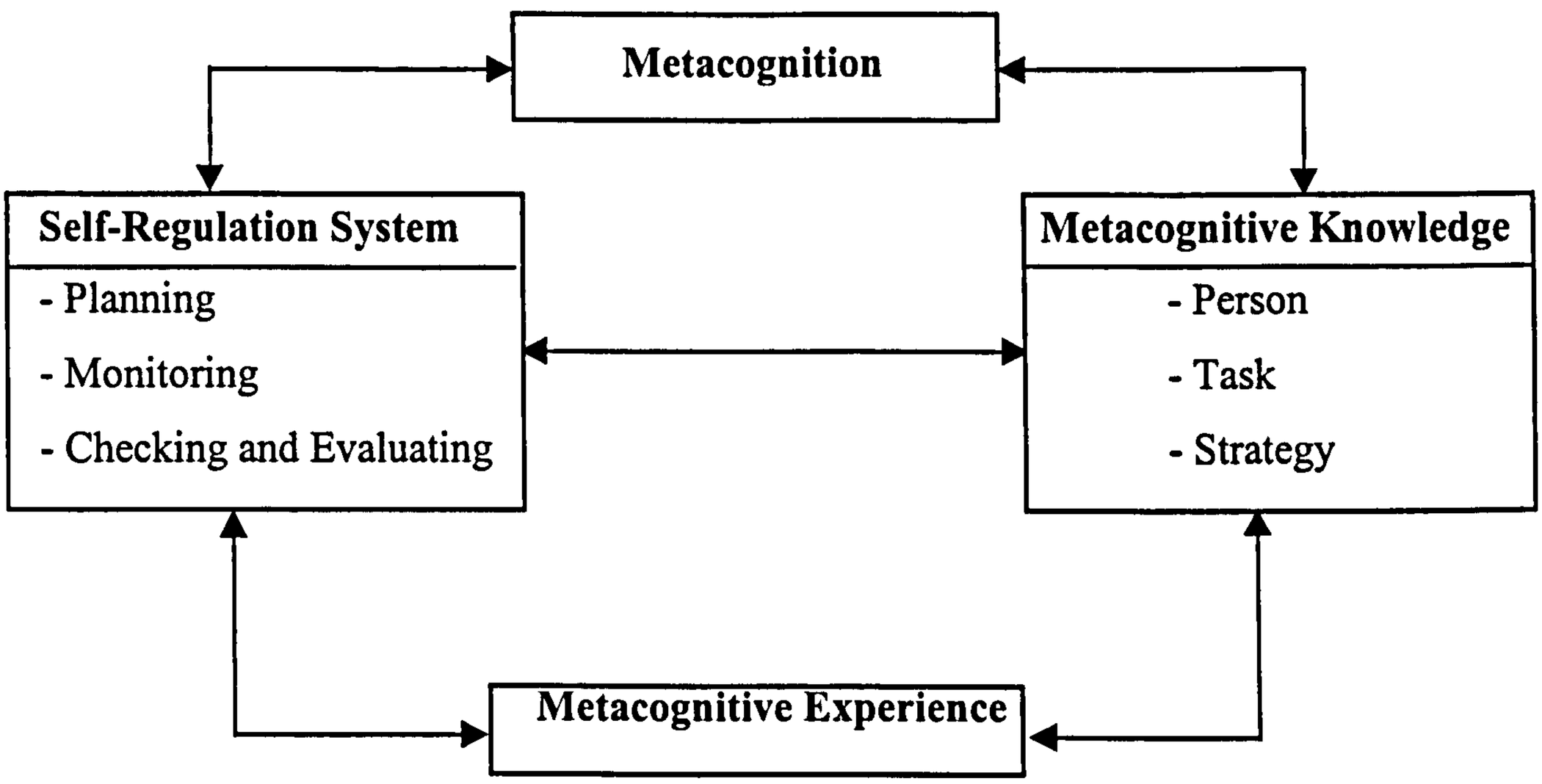

Figure 1: Model of Metacognitive Components
(An interactive and integrative model)

Implementation of Metacognition Research

In concluding this discussion on components of metacognition, I would like to indicate how some of the models described above can be implemented.

Training in the use of metacognition pertaining to the regulation of task-relevant cognitive strategies leads to dramatic improvement in performance. This has been found to be true in reading (Brown et al. 1990), writing (Bereiter & Scardamalia 1987) and the use of general learning strategies (Weinstein & Mayer 1986; Kluwe 1987; Corkill & Koshida 1993). It should be noted, though, that metacognitive regulation

always applies to particular, task-related cognitive strategies, and thus calls for the acquisition of the latter together with training in metacognition.

Although theoretically, cognition and metacognition are not interchangeable, they nevertheless operate in a correlated manner (Weinert 1987). A current emphasis in psychology and education is what Brown, Campione and Day (1982) refer to as devising instructional routines to "help students learn to learn" (14), and "learning how to learn from reading" (22).

Brown et al. (1982) discuss 'blind' training studies (in which students are induced to use strategies without understanding the significance of the activity), 'informed' training studies (in which students are induced to use a strategy and are given some information about its significance) and 'self-control' training studies (in which students are instructed in the use of the strategy and are also explicitly taught how to employ, monitor, check, and evaluate the strategy). Recent research indicates that self control training results in superior benefits (efficacy, durability, generalisability).

In an integrative study concerning attempts to teach metacognitive reading strategies, Haller et al. (1988) synthesised 20 studies and found an average effect size of 0.71. This means that, on the average, the treatments studied improved students' reading by 70 percent of a standard deviation. An effect size this large in instructional intervention is considered very high.

Brown and Campione (1978) describe the properties that cognitive activities to be taught require: (a) trans-situational applicability; (b) the sense on the part of children that these are reasonable activities that work; (c) a counterpart in real-life experiences; and (d) an understanding of component processes so that effective training techniques can be devised. These studies found that systematic training increases the quantity and quality of children's metacognitive knowledge and monitoring skills.

Another major justification for promoting and fostering metacognitive skills in teaching is that they appear to have 'ecological validity'; that is, there are recognisable counterparts in 'real world, everyday life' situations. Checking the results of an operation against certain criteria of effectiveness, economy, or common-sense reality is a metacognitive skill applicable whether the task under consideration is solving a math

problem, reading for meaning, memorising a passage of prose, following a recipe, or assembling an automobile or a piece of furniture. Self-interrogation concerning the current state of one's own knowledge during any reading or problem-solving task is an essential skill in a wide variety of situations: those of the laboratory, the school, and everyday life.

Metacognitive skills possess an enormous potential for 'transfer'. 'Transfer' means learning something in one situation and then applying it to another, significantly different, one. After a series of experiments, Brown (1994) and Campione and Brown (1990) concluded that transfer is more likely when (a) the knowledge to be transferred figures in a cause/effect relationship; (b) there is emphasis during learning on flexibility and the possibility of multiple application; (c) some effort is made to separate the principle from the initial learning context. The latter two conditions correspond to Salomon and Perkins' (1989) conditions for 'high road' transfer. Their theory distinguishes between two fundamentally different mechanisms of transfer: 'low road' and 'high road'. 'Low road' transfer depends on the reflexitive activation of well-practised patterns. It is automatic and mindless. In contrast, 'high road' transfer depends on the conscious, aware abstraction of principles from one context, to their application in another.

Salomon et al. (1989) engaged students in using a computer-aided reading tool called 'The Reading Partner'. The tool prompted students to ask themselves questions while reading, such as "What image can I make of what I am reading?", "What can I predict from the title?", "Does the text make sense?", "Does it ring a bell?" and "What are the key sentences here?" Students were strongly urged to respond to these cues. Their reading improved substantially. More to the point, the investigators administered a *writing* task to the students one month later. Those who had worked with 'The Reading Partner' exhibited better writing: they had made fertile generalisations from reading to writing. This study promoted conscious high-order reflection - metacognitive skills which stimulated conscious abstraction, leading to 'high road' transfer.

Metacognitive Awareness and Reading

In this section, I suggest a conceptualisation of reading through strategies, as well as the role of knowledge and comprehension monitoring in the learning situation. I will argue that efficient use of reading strategies cannot be achieved without the metacognitive components of knowledge and monitoring.

The tetrahedral model of learning (adapted from Bransford 1979, Jenkins 1979 and Brown 1982a, 1982b) provides a useful tool in demonstrating a bond between metacognitive skills and reading in order to learn (Figure 2).

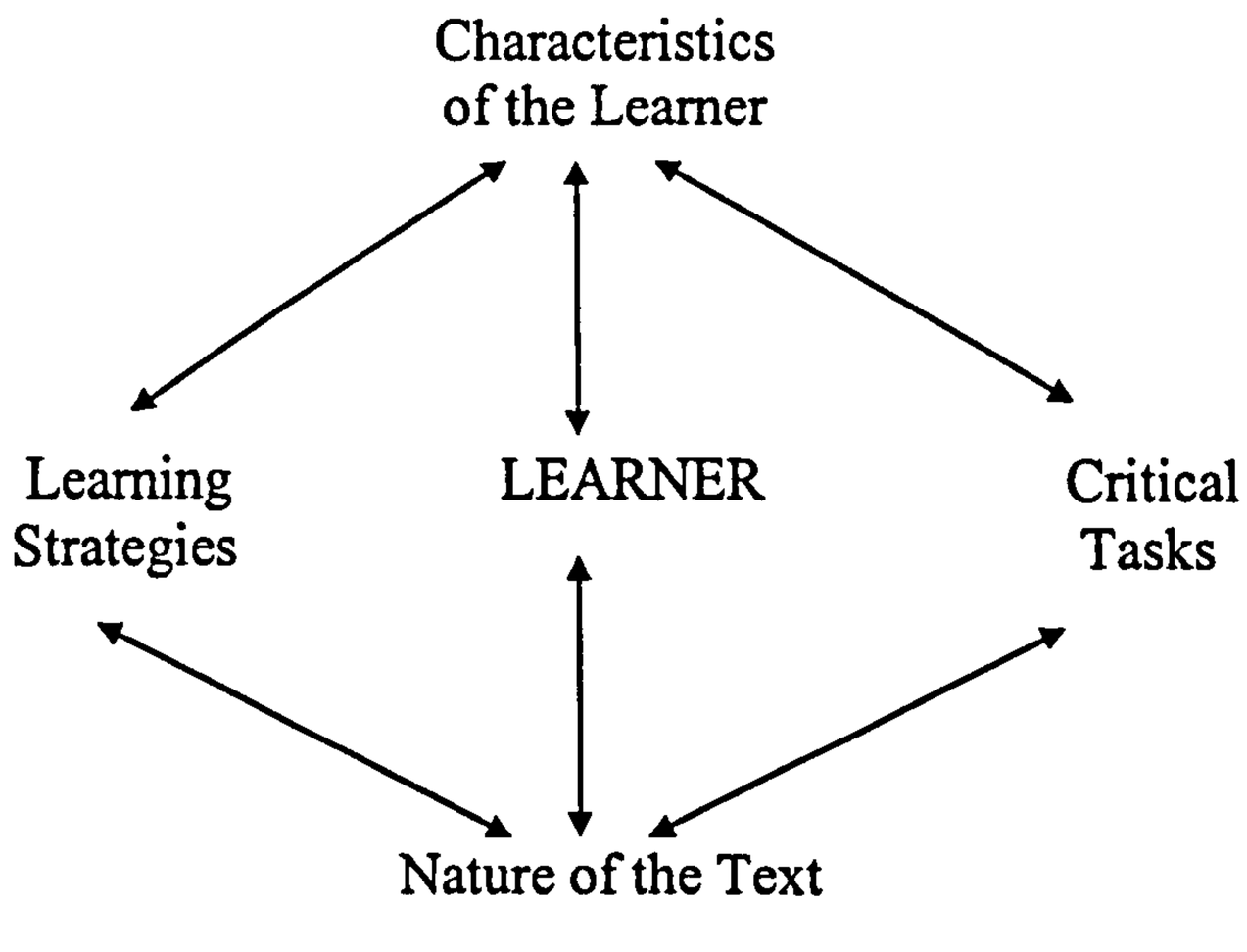

Figure 2: The Tetrahedral Model of Learning from Text
(An interactive and integrative model)

The model represents the learning situation, i.e., the learner in context. In accordance with the tetrahedral model, metacognitive awareness in reading-to-learn involves the knowledge and control of four variables and the manner in which they interact to produce learning. These variables are:

1. *Nature of the text* - the natural materials to be learned which influence comprehension and memory (difficulty, familiarity, interest, structure)
2. *Critical tasks* - the storage and retrieval requirements of the task to be performed by the learner as evidence of learning
3. *Learning strategies* - the activities engaged in by the learner to store and retrieve information from the text

4. *Characteristics of the learner* - ability, motivation, and other personal attributes and states that influence learning

The learner considers a learning task from the viewpoint of the centre of the tetrahedron. In designing a plan for learning, the four points of the model must be considered. The following review of metacognitive awareness and reading is organised around these four categories of metacognitive knowledge and control. Since the four variables interact in a complex way in any learning situation, this classification scheme is necessarily somewhat arbitrary.

The first variable, the ***nature of the text***, refers to the textual features of learning materials including factors such as the arrangement of ideas, vocabulary, syntax, clarity of the author's intentions, and the reader's interest and familiarity with the text. All these have an effect on students' learning. Salient findings from the research note three basic points:

One) text structures influence learning even if the learner is unaware of their effect

Two) knowledge of the effect of text structures on learning depends on age and ability

Three) a reader can optimise learning by becoming aware of text structures and the resultant effect they have on learning

Knowledge of text structure and an awareness of the role that text features play in any learning situation, are essential for reading comprehension, constructing meaning, and learning performance, as well as for the efficient use of study time.

By detecting the organisational patterns or structures of texts, learners can observe how authors arrange ideas and determine which kinds of structures are used to interrelate ideas. Several studies demonstrate this point. Owings et al. (1980) found that knowledge of the effect of text structure on learning is a prerequisite to the conscious control of strategies that accommodate this feature. Successful and less successful fifth graders read and studied 'arbitrary' and 'non-arbitrary' versions of stories, rated them for difficulty and justified their responses, and then were asked to recall the stories. All children remembered the logically structured passage better than the arbitrary passage, but only the more successful students consistently recognised that the arbitrary passage was more difficult and suitably justified their answers. Furthermore, the better students spent more time reading and studying the arbitrary passages, whereas the study times

of less successful students were the same for both types. The more aware the students were of the difference in text structure and the effect of this difference upon their performance, the better they were able to adjust their study strategies. Poorer students, who were not aware of the structural difference, made no appropriate adjustment in their study behaviours.

Good (more successful) readers are sensitive to various kinds of text structure and use this information to understand and remember what they are reading. An expert learner, designing a learning plan, might first examine the text itself and make decisions about the kind of material it is. Is it a story? An expository text? An instruction text? Primary text forms have standard structures that can be identified by astute learners and help them guide their reading process. For instance, stories have been found to have a standard structure (Stein & Glenn 1979). In a simple story, the hero or heroes reach a desired goal after overcoming an obstacle. More complex forms include competition, conflict, or sharing between major characters (Bruce & Newman 1978). Authors strive to provide clues to guide readers, or misguide them, as in the typical mystery story. Clues as to the character of the protagonist may be in his physical description or the description of his early behaviour. General themes of surprise, danger or villainy are created intentionally by the author and can be used by readers to help them understand the plot.

The more the reader knows about such standard story characteristics, the easier it is to read and understand stories. For any text, awareness of the role that text features play in learning is essential if the learner is to use the features consciously to enhance learning from text.

Another area of research in metacognitive awareness concerning text features relates to how learners identify the difference between an easy and a difficult text. Many factors render texts easy or hard to read, and sensitivity to these factors can be a subtle form of knowledge. A poor reader has difficulty with even basic distinctions, such as whether a text is readable or not.

Canney and Winograd (1979) presented children in grades 2 through 8 with passages that were intact or disrupted at four levels of severity: correct syntax, but some

semantically inappropriate words; semantic and syntactic violations, but some semblance of connected discourse; strings of random words; and strings of random letters. The children were asked if each passage could be read and why. Children in second and fourth grades, and even sixth graders identified as poor comprehenders, focused on the decoding aspect of reading, and claimed that all but the letter strings could be read. In contrast, better readers, who knew that understanding was the primary goal of reading, identified only the intact texts and those with correct syntax as readable. The poorer readers behaved as if reading involved merely identifying words; a passage with unrelated words was judged just as readable as an intact passage.

Another variable of metacognition in reading-to-learn pertains to the ***critical tasks*** that the reader is required to perform. For example, locating a specific detail in a text requires a different process than that needed to write a critical analysis of the text. As with other facets of metacognition, mature and immature learners differ with respect to their knowledge of, and ability to control, task variables.

Fundamental to any task in reading is the derivation of meaning from the text. In order for learning to occur, students must be aware that the purpose of reading is to construct meaning. Younger and poorer learners are not aware that they must attempt to make sense of a text; to them, reading is a decoding process rather than a search for meaning or a means of learning (Canney & Winograd 1979; Denney & Weintraub 1963, 1966; Johns & Ellis 1976; Myers & Paris 1978). If students are unaware that reading is supposed to lead to understanding, it is difficult to see how they can monitor their own status in this regard. Even if students do know that they must attend to the meaning of what they read, this is not enough to make them experts. They must also realise that different reading behaviours are necessary for different kinds of reading tasks, and that they should adjust their behaviour accordingly.

Forrest and Waller (1979) asked third and sixth graders to read 500-word stories, giving them four different instructions: (1) read for fun; (2) read to make-up a title; (3) read as quickly as possible to find one specific piece of information (skim); and (4) read to study. After reading each story, the children took a multiple-choice comprehension test.

They found that the ability to adjust reading strategy to an assigned purpose increased with reading ability. Only with sixth-grade good readers was retention significantly higher in the study condition than in the skim condition.

Another aspect of metacognition of task characteristics is the learner's ability to accurately predict his or her performance with respect to the demands of the task. Sensitivity to the match between knowledge and demands comes particularly late in the development of metacognitive skills. One clue to development of this type of metacognition is in the student's selection of *retrieval cues* as they prepare for future recall attempts. A retrieval cue helps the learner remember what s/he needs to know in order to perform a task; retrieval cue selection thus reflects the learner's estimation of memory capacity with respect to task demands. An example of research on retrieval cue selection is a study described by Danner (1976). The children in this study were asked to select retrieval cues - three sentences that would later help them remember the rest of the passage - and to explain their selection. The number of children who explained that they selected review notes according to the topical organisation of the passage increased significantly with grade level. It was not until sixth grade that the majority of children could select a suitable sentence, the topic sentence, as a cue to retrieving a paragraph from memory.

Brown, Smiley and Lawton (1978) and Brown, Campione and Barclay (1979) concluded that the ability to select suitable retrieval cues required a degree of sensitivity to the demands of task learning. The successful user of flexible retrieval must have:

- information concerning his or her current state of knowledge, i.e. what he or she knows and does not yet know of the text
- knowledge of the fine gradations of the importance of various elements of texts (what is important to know and what can be disregarded
- the strategic knowledge to select retrieval cues from previously missed information

An additional category of metacognitive knowledge and control involves knowing how to remedy comprehension failures - ***learning strategies***. It is not enough to be aware of

one's understanding or failure to understand - a learner must be able to self-regulate his or her reading process in order to read for comprehension. Metacognition involves not only knowing what one does and does not know, but also knowing what to do to remedy comprehension failures in order to increase learning. This knowledge represents metacognition about strategies.

Researchers cite two different categories of strategies:

- *'fix up' strategies* - to resolve comprehension failures
- *studying strategies* - to enhance storage and retrieval (where comprehension failure is not necessarily an issue)

'Fix up' strategies: When comprehension fails, the reader must make several important strategic decisions. First, the reader must decide whether to take *any* remedial action, a decision that depends largely on the purpose for reading. If the reader decides to take some action, s/he has several options: to store the confusion in memory as a pending question in the hope that clarification will be forthcoming; to reread the text; to look ahead in the text; or to consult another source (Alessi, Anderson & Goetz 1979).

Paris and Myers (1981) obtained several measures of the comprehension monitoring and study strategies of good and poor fourth grade readers. In one phase of the study, students were directed to read and remember a story containing some difficult vocabulary words. They were each provided with blank paper, a pencil, and a dictionary, and told they could write or ask questions. Good readers asked questions, took notes, and used the dictionary more than poor readers. Furthermore, only good readers asked for the meaning of unknown words; poor readers were more interested in pronunciation.

Garner, Wagoner and Smith (1982) observed the behaviour of good and poor sixth grade comprehenders as they tutored fourth graders, and used this behaviour as an index of the sixth graders' metacognitive development. The task involved reading an expository passage and answering reader- and text-based questions about the passage. Reader-based questions were based on the reader's existing knowledge; text-based questions were based on information presented in the passage. Results showed

significant differences between good and poor comprehenders along several measures: (a) the number of times the sixth-graders encouraged the younger children to 'look back' in the text; (b) the number of times they encouraged look-backs for text-based questions (where look-backs are appropriate) versus reader-based questions (where look-backs are inappropriate); and (c) their ability to direct the reader's attention to the relevant text segment in order to answer the question. In other words, good comprehenders encouraged their tutees to use look-backs and informed them when and where to do so; poor comprehenders were less effective tutors. That good readers attempt to teach this look-back strategy to younger children seems to reflect the fact that they are well aware of the usefulness of this strategy for learning.

In considering studying strategies, it is important to distinguish between a *technique* and a *strategy*. Students can use technique 'blindly', that is, not deliberately to process text information. A technique becomes a strategy only if students have the (metacognitive) knowledge of *when, where* and *how* to use it. This distinction between techniques and strategies explains the lack of effect found in some research (Anderson & Armbruster 1980), in which students are encouraged to use techniques whether or not they have the metacognitive skills to use them strategically.

Studying strategies: Another important class of strategies in reading-to-learn are activities intended to enhance test processing and memory. Some of the more common studying strategies are underlining, note-taking, outlining, summarising, and self-questioning.

Most of the evidence on the development of metacognition as it relates to studying strategies, comes from training studies in which students were taught to use a particular strategy that substantially improved their performance on the criterion task. Presumably, such improvement was possible because the students had been deficient in the tools for effective learning from text, including metacognitive skills. The successful training studies all included instruction to heighten students' metacognitive awareness of the studying situation, including *when, where* and *how* a strategy should be used. Ebo and Stewart (1985) discuss several strategies for improving comprehension. These

include forming a mental image, rereading, adjusting the rate of reading, searching the text to identify unknown words and predicting meaning that lies ahead.

Many studies indicate that all readers use strategies, but that a distinction exists between good readers and poor readers. Good readers tend to use the most effective strategy, one that leads to thorough processing of the text. The research also supports the notion that readers can be taught to develop self-awareness and control of learning. Among the successful training studies in studying strategies are the following:

- teaching outlining to high school students (Barton 1930)
- training seventh, ninth, and twelfth graders to outline and summarise (Salisbury 1935)
- instructing average and remedial junior college students to summarise (Day 1980)
- teaching self-questioning skills to high school students (Andre & Anderson 1978-79) and to seventh-grade poor comprehenders (Palincsar & Brown 1981)
- training hearing (Dansereau 1979) and hearing-impaired (Lang, Hein & Coggiola 1978) college students to use a semantic mapping method

All these studies reported improved reading performance by middle school, junior high, and high school students who were trained to use specific studying strategies (Gertz 1994; Langer & Neal 1987).

The final variable of metacognition in reading-to-learn is awareness of the ***characteristics of the learner*** such as background knowledge, degree of interest, skills and deficiencies; and of how these affect performance on learning tasks. The learner must be able to translate the awareness into a change in reading behaviour.

Experts (more successful readers) try to make the text more meaningful by attempting to understand the significance of what they are reading, or by trying to fit the new material into their own personal experience (Bransford et al. 1980). In an interview study, Myers and Paris (1978) found that both second and sixth graders were aware that their background knowledge and interest affected their reading performance. However, there was a difference between knowing that these characteristics affect their reading comprehension and knowing how to harness this information when learning from text.

One learner characteristic that has received attention in research on metacognitive awareness in reading, is awareness and activation of relevant prior knowledge. Bransford et.al (1985) reported on several studies in which academically unsuccessful fifth graders exhibited difficulty in using their existing knowledge to help them learn. Fifth graders were asked to read a passage about camels. Part of the passage emphasised problems such as surviving desert sandstorms; other parts mentioned facts such as "Camels can close their nasal passages and have special eyelids to protect their eyes." Many of the academically less-successful students failed to utilise information about the sandstorms to interpret the significance of facts about the camels' nasal passages and eyelids. However, successful students who did understand how various properties of camels helped them survive desert sandstorms had a basis for understanding a new passage describing the clothing worn by desert people (e.g., these students could understand the significance of wearing veils or other forms of face protection).

Less successful students had the background knowledge necessary to learn the information, but they consistently failed to use this knowledge. They failed to ask themselves how potentially available information could clarify the significance or relevance of new factual content. Bransford et al. (1980,1985) report success in teaching students to ask themselves questions designed to activate relevant prior knowledge (one of the main elements of the Metacognition Awareness Guidance offered to subjects of this study and described in Chapter II below). Another study by Bransford and his colleagues (cited in Brown et al. 1983) replicated the finding that less successful fifth graders were less likely to use their knowledge to clarify the significance of factual content and make it more memorable, even though the necessary knowledge was available in the text itself. Sullivan (1978) reported that poor readers at the high school level had difficulty relating prior knowledge to what they were reading. Even at the college level, individual differences in the use of background knowledge during reading have been documented (Spiro & Tierre 1980). Thus, as with texts, tasks, and strategies, metacognitive skills distinguish between mature and immature learners. In the case of learner characteristics, one distinguishing skill is the

extent of utilisation of background knowledge during reading. Thus, the research reveals a consistent pattern regarding metacognitive awareness in reading:

- Metacognitive awareness relates to proficiency in reading
- Students were helped to develop control of learning by being informed about the interaction of the various factors and the importance of assuming an active role in regulating the interaction
- Students can be trained to be aware of the influence of characteristics of text, task, strategies, and themselves as learners, on learning performance
- Metacognitive knowledge can enable students to become more effective learners.
- Metacognitive awareness can influence students' learning outcomes and their performance and learning ability

The importance of prior knowledge in reading comprehension, construction of meaning, and learning has been demonstrated throughout the discussion in this chapter. One of the main conclusions from this discussion is that when we talk about metacognitive awareness, we are actually talking about knowledge and knowing, and about being aware of knowledge in order to know. Thus one's knowledge and one's awareness of this knowledge will determine the level of understanding, of creation of knowledge, and of construction of meaning.

Basically, the terms metacognition, meta-comprehension, and metacognitive awareness refer to being:

- aware of the various factors involved in the learning situation - the characteristics of the text, the requirements of the task, applicable strategies and the learner's own abilities and deficiencies
- aware of different kinds of prior knowledge (linguistic knowledge, grammar knowledge, strategy knowledge, textual knowledge, contextual knowledge, overall prior knowledge and specific prior knowledge)
- aware that the different kinds of prior knowledge can and need to be used in the attempt to learn and construct meaning
- aware that using this prior knowledge and background will effect the ability to learn from reading and will effect learning performance
- able to use this prior knowledge consciously

Another, albeit tentative, conclusion about metacognitive awareness is that knowledge precedes control. Learners must have knowledge of the effects of the factors of text, as well as knowledge of the task and their own characteristics as learners, before they can

strategically control the learning process to optimise the influence of these factors on their understanding, meaning-construction, and performance.

In other words, before learners can use effective studying strategies, they must be aware of text, task, and self, and how these interact to affect learning. To establish the importance of prior knowledge in the process of reading, comprehension, and understanding, I will now describe schema theory.

Knowing when you know; knowing what you know; knowing what you need to know. - Ann Brown 1980

Comprehension is the use of prior knowledge to create new knowledge. Without prior knowledge, a text is not just difficult to interpret, it is meaningless. - Adams and Collins 1979

What they don't know will hurt them. - Wilson and Anderson 1986

Schema Theory

Schema theory is basically a theory about knowledge. It is a theory about how knowledge is represented and about how that representation facilitates the use of knowledge in particular ways. According to schema theory, all knowledge is packed into units. These units are called schemata (the plural of schema). Schemata reflect the prior knowledge, experiences, conceptual understandings, attitudes, values, skills, and procedures a reader brings to a reading situation. Embedded in these packets of knowledge is, in addition to the knowledge itself, information about how this knowledge is to be used.

Schemata have been called the 'building blocks of cognition' (Rumelhart 1980) and a 'cognitive map of the world' (Neisser 1976) because they represent the abstract structure of knowledge and the elaborate networks of concepts, skills, and procedures which we use to make sense of new stimuli, events, and situations. This abstract term is used by cognitive psychologists to describe how humans organise and construct meaning.

Instructionally, schema theory addresses:

- The essential role of *prior knowledge* in learners' performance
- The contribution derived from *activating the learner's prior knowledge*
- The significance of fostering the learner's ability to *focus attention on information* relevant to performance
- The significance of fostering the learner's ability to *build connections among relevant pieces of information*
- The significance of fostering the learner's ability to *build connections between existing knowledge and new knowledge*

The role of prior knowledge

Anderson (1983) discussed six functions of schemata which illustrate why prior knowledge, possessed by the learner, has a pervasive effect on performance, and why prior knowledge of the topic/issue/subject of the text is a potent determiner of learner performance.

1. *Schema provides ideational scaffolding* - it embodies structural organisation of the information it represents. Important text information fits into places called slots within the schema.
2. *Schema directs allocation of attention* - it can help a reader determine the important aspects of a text, thus serving as a guide for allocating cognitive resources. Skilled readers may use their schemata to judge how important and how familiar information is, and then pay more attention to what is more important or less familiar.
3. *Schema enables inferential elaboration* - no text is completely explicit. Facts necessary for comprehension are often omitted. The reader's schema provides the basis for making inferences that go beyond the stated information in order to complete the meaning of the text, thus ensuring comprehension.
4. *Schema allows orderly searches of memory* - it has slots for certain types of information. Thus it can guide the reader to the kinds of information that need to be recalled. Of particular importance may be the order in which the slots occur. By tracing thorough the schema used to structure the text, the reader gains access to the particular information learned when the text was read.
5. *Schema facilitates editing and summarising* - it contains criteria for determining the relative importance of different items of information. A reader can draw on these criteria in order to compose summaries which include significant propositions and omit trivial ones.
6. *Schema permits inferential reconstruction* - when there are gaps in memory of the text, the reader's schema - coupled with the specific text information that can be recalled - helps to generate hypotheses about the missing information. Suppose that a diner cannot remember the beverage she ordered while eating at a restaurant. If

she can recall that her entree was fish, she will be able to infer from her schema that the beverage may have been white wine.

To summarise - *Schema* provides a framework that allows readers to *organise* text information more efficiently and effectively and to integrate new information into old, which facilitates retention. *Schema* allows readers *to make inferences* about what happened or is likely to happen in the text, thus helping learners to predict upcoming information or to fill in gaps in the material. *Schema* helps readers to *elaborate* upon the material. Elaboration, a cognitive activity that involves speculation, judgement, and evaluation, is a powerful aspect of reasoning with print.

Schema theory provides powerful support for the importance of prior knowledge in reading comprehension, meaning construction, and learning. According to schema theory, readers understand what they read only as it relates to what they already know, e.g., their existing knowledge about a particular topic influences the extent to which they understand what they will read about that topic.

In general terms, schema engagement relates to: (1) the reader's initial contact with a text, (2) the reader's ability to relate his or her own background of experience to the information represented within the text, and (3) the reader's ability to focus and refine his or her understanding of the text material. In particular, the notion of schema engagement addresses the issues represented by the following questions:

- Was the reader's schema engaged prior to reading, during reading, and after reading?
- To what extent did learning occur? Was the reader's relevant background of experience focused and structures during reading?

Over the years, researchers have demonstrated that readers use their prior knowledge to integrate new information, and that prior knowledge can be used to disambiguate text, indicating that prior knowledge is a major influence on reading comprehension (Bransford & Johnson 1972; Pearson, Hansen & Gordon 1979; Langer & Nicholich 1981; Johnston 1984). Other researchers have found that many poor (less successful) readers have difficulty using prior knowledge (Lipson 1982; Marr & Gormely 1982; Holmes 1983).

In their review, Pearson et al. (1979) suggested that increasing a child's store of conceptual knowledge may do more to increase reading comprehension than skill training. They tested the comprehension of second grade children having high and low levels of knowledge about spiders, on a text that dealt with spiders. The children differed on spider knowledge, but not on IQ or achievement test scores. Both explicit and implicit questions were asked to assess comprehension. The high-knowledge group performed significantly better overall, mainly due to their ability to answer the implicit questions. This suggests that comprehension requiring integration of text and world knowledge may be especially facilitated by strong knowledge of the content topic. An important point to be drawn from this and other studies (such as Spilich et al. 1979) is that all the subjects had some knowledge about the content subject being investigated. Clearly, it is the extent and quality of that knowledge that determines how well a text is comprehended.

Research has emphasised that not only does lack of knowledge about a topic impede comprehension, but the extent of knowledge influences the quality of understanding a reader can construct. Research by Voss and his colleagues (Means & Voss 1985; Spilich et al. 1979) and Chi and her colleagues (Chi 1978; Chi, Feltovich & Glaser 1981; Chi, Glaser & Reese 1982; Chi & Koeske 1983) showed the advantage in comprehension for high knowledge versus low knowledge individuals. Johnston demonstrated the effect of prior knowledge on reading comprehension test scores, and concluded that (a) "prior knowledge influences the comprehension of texts" and (b) "prior knowledge is an important source of test bias" (Johnston 1984: 236). When Johnston refers to bias in reading comprehension tests, he is referring to standardised measures of reading comprehension which give one score compiled from questions on several short passages.

Because a text is rarely fully explicit, readers must draw from their existing knowledge in order to understand it. Authors expect readers to 'fill in' and 'connect' information in certain predictable way. Decisions about what to fill in and how to connect parts of text are made on the basis of prior knowledge: specific prior knowledge (text-specific and topic-specific) and general world knowledge.

The reader brings this knowledge to any new task; learning can be processed only within the framework of this prior knowledge. The reader's contribution to the act of comprehension is significant. Therefore, the meaning constructed from the same text can vary greatly among readers because of differences in the level of knowledge available to understand the text, or because some readers may have knowledge that they do not fully utilise. Variations in interpretation often arise because readers have different conceptions about the topic than the author supposed (Anderson 1983). From this we arrive at three reasons to explain why readers fail to correctly understand a text:

1. The reader may not have the appropriate schemata. In such a case, s/he simply cannot understand the concept being communicated.
2. The reader may have the appropriate schemata, but the clues provided by the author may be insufficient. Here again, the reader will not understand the text but, with appropriate additional clues, may come to understand it.
3. The reader constructs his or her own meaning. The conception of meaning, which is uniquely determined by each reader and is viewed as dynamic, fluid, socially and culturally located, is illusive.

One clear implication of this, is that some learners may appear to have poor comprehension and understanding skills, not because they have some inherent comprehension or understanding 'deficits', but because they lack or fail to activate the prior knowledge (background knowledge) that was presupposed by the message or the text. Clearly, there are many different levels at which a learner may lack the background knowledge necessary to understand the text.

Activating and building schemata

Another educational application which emerges from the schema theory of reading comprehension is the need to help students to act upon and interact with the main ideas of a reading selection *before* they encounter them in print. The value of *pre-reading preparation* lies in helping comprehenders recognise what they know and what they need to find out more about. This involves building and activating schemata. Two pivotal questions that readers must ask themselves as they approach a reading task are, "What do I already know about the subject?" and "What do I need to know?". These

two questions are essential components of the Metacognitive Awareness Guidance as developed in this research.

"What do I already know?" spurs thinking. Readers must learn how to take inventory of their own store of knowledge and experience. Helping students reflect in this manner is crucial from an instructional point of view. For one thing, it's a great confidence booster to know that you know something about a subject to be encountered in print. One of the challenges of teaching is convincing children that they know more about the text than they often give themselves credit for (Vacca, Vacca & Gove 1995). On the other hand, "What do I already know?" helps students recognise what they don't know, but *will learn more about* from reading. When faced with a text selection, they may lack an *available* schema for comprehending the material. Here is where background-building activities will help develop a frame of reference to enable students to handle incoming information in text. Although students may have a schema for reading, they may fail to bring it to bear as they read. Novice readers are often unaware that prior knowledge is of any consequence to what they need to know; yet they soon recognise the importance of establishing goals and plans for reading. Searching for answers to questions such as, "What do I need to know?" leads to prediction-making and goal-directed behaviour.

Tierney and Pearson (1992) drew up a set of pedagogical questions driven by a schema theoretic perspective. They suggested using this set of questions as guidelines for an instructional decision-making process to improve students' reading comprehension and learning from text. This set of questions, paraphrased below, is used in this research as a means of designing, developing, and crafting metacognitive awareness guidance:

- Does the reader possess the relevant schemata needed for approaching a text?
- Is the reader's schema (purpose, background knowledge, attention, focus, interest) activated prior to, during, and after reading? Is the reader's relevant background experience activated during reading?
- When reading for different purposes, does the reader exhibit flexible processes in terms of activating, focusing, maintaining, and refining an interpretation?
- Is the reader aware of the strategies available for coping with different texts and purposes for reading?
- To what extent is the reader's understanding adequate for coping with the text? When a reader's understanding diverges from the author's intention, does the

reader justify his or her idiosyncratic interpretation? Does the reader recognise his or her perspective and the perspective of others?

- Is the reader aware of his or her level of understanding of a text read for different purposes?
- Does the reader recognise new learning and its potential application?

More specifically, and with respect to reading comprehension, schema theory encouraged us to ask: "*What is it that children may already know? And how can I use what they know to help them deal with the new ideas that I would like them to know?*" rather than, "*What is it that children do not know? And how can I get it into their heads?*"

Schema theory also encouraged us to examine text from the perspective of the knowledge and cultural backgrounds of our students in order to evaluate the connections that they were likely to be able to make between ideas in the text and the schema that they bring to the reading task. In addition, schema theory promoted a constructivist view of comprehension, a view that says that all readers have to construct a coherent model of reading for the texts they read. Given the emphasis on the central role of prior knowledge, schema theory could not hold otherwise. The most important consequence of the constructivist perspective is that there is inherent ambiguity as to *where* meaning resides. Does it reside in the text? In the author's mind as s/he sets pen to paper? In the mind of the reader who builds a unique model of meaning stemming from personal experience and reading? In the interaction between reader and the text?

Readers construct their own meaning

In accordance with schema theory, meaning is not a product, but a process. The continuous process of transaction between the individual and the environment and, in our case, between the reader and the text, between old schemata and new.

Meaning is determined through the process of transaction between reader and text ('top down' processing), between text and reader ('bottom up' processing), between reader/text and context, and among textual elements on and across various levels. Schema theory holds that meaning is not a 'sum of parts' which can be separately

identified; there is no sharp separation between the owner of the knowledge and the knowledge itself (Adams & Collins 1979; Davis 1944, 1968, 1972). Reading is an organic dynamic process. The term 'transactions' is used to suggest the dynamic change that takes place in readers whenever they decide to actively engage in reading, in constructing meaning, understanding, learning - making sense of what is being read.

The figure below is a simplified illustration of transaction elements involved in the meaning-making process:

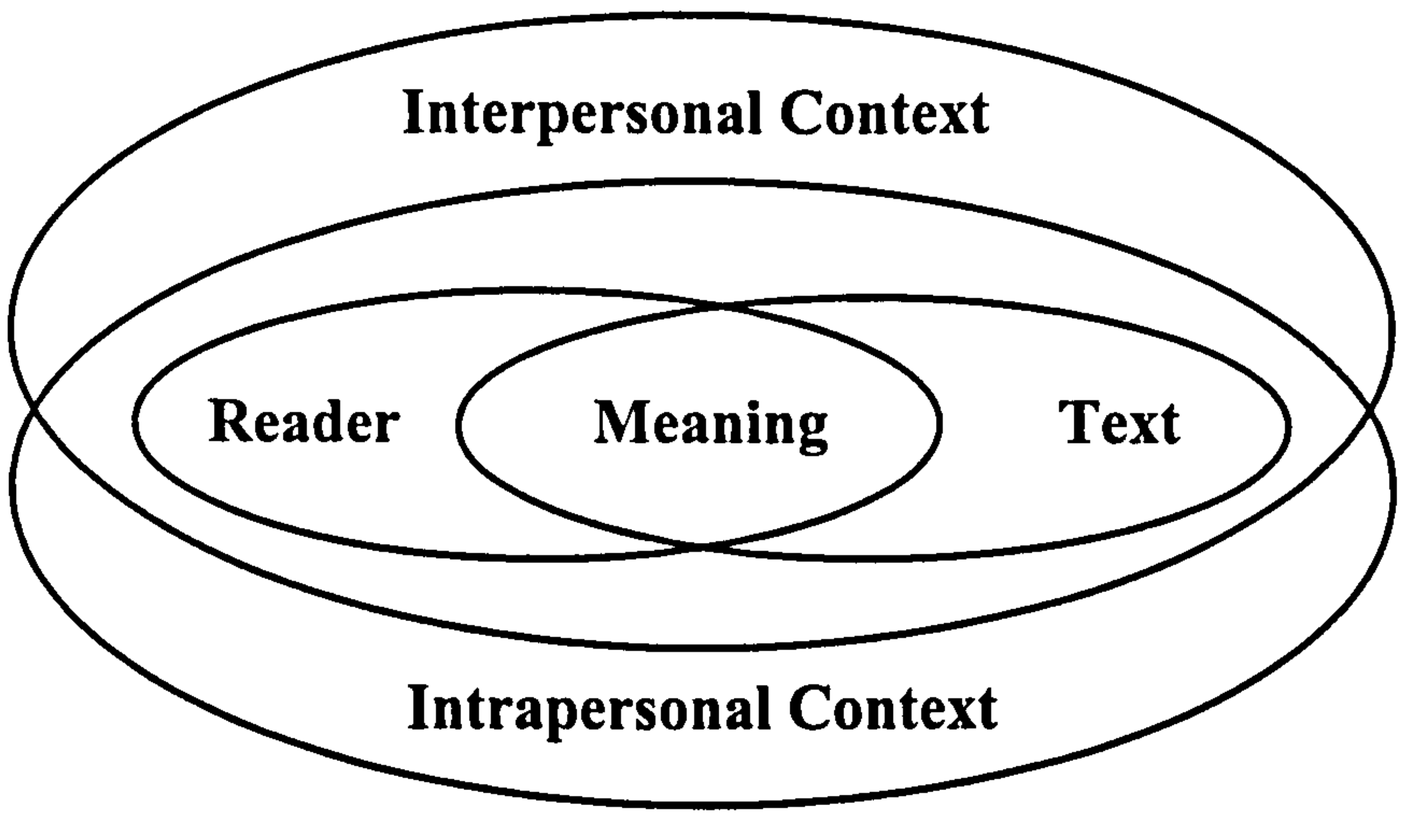

Figure 3: Transactions in the Meaning-making Process

A key point in schema theory, then, is that reading comprehension is akin to the progressive refinement of a scenario or model that a reader develops for a text. That is, reading comprehension proceeds and inferencing occurs via the refinement of the reader's own model. Collins, Brown and Larkin (1977) described the refinement of the reader's model as follows:

> *The initial model is a partial model, constructed from schemas triggered by the beginning elements of the text. The models are progressively refined by trying to fill the unspecified slots in each model as it is constructed...and the search for relevant information is constrained more and more* (4-5).

Within this framework, the reader's schemata drive text-processing toward the refinement of a model or scenario that 'matches' the text to the reader's world and that is complete, interconnected and plausible. That is, the reader's schemata will be involved in the construction of a scenario which accounts for elements and relationships within the text and in the world as the reader sees it. If the reader's model seems tenable, then those schemata that comprise the model will be involved in the further text processing. If the reader's model seems untenable, then schemata will drive

the re-examination, reconstruction, or restructuring of elements in the text to build a new model.

To summarise the above, the following statements can be made about reading comprehension: (1) a reader's background knowledge, including his or her purposes, has an overriding influence upon the reader's development of meaning; and (2) reading comprehension involves activating, focusing, maintaining and refining ideas towards developing interpretations (models) that are plausible, interconnected and complete. In addition, there is a sense in which the reader's comprehension involves two other facts: the reader's *knowing* (either tacitly or consciously) that his or her interpretations of a text are plausible, interconnected, and complete, and, ideally, the reader's *evaluation* of the transfer value of any acquired understandings.

Langer (1989) proposed four kinds of relationships that occur during the reading process as readers' attitudes shift while they try to understand the text:

- *Being out and stepping in*. Readers use the information from the text and their background knowledge to get enough information to 'step into' the author's vision. In literature, readers try to make an initial acquaintance with the characters, plot, and setting; in exposition, they try to figure out what the topic is about.

- *Being in and moving through*. Readers immerse themselves in the author's vision, trying to understand the author's meaning. In exposition, readers take each new bit of information, try to understand it and link it to what they already understand the text is saying about the topic. In fiction, they use each new bit of information to go beyond what they already understand - asking questions about motivation, causality and implications.

- *Being in and stepping out*. Readers relate the text to their own knowledge and experiences. Readers of fiction use what they read in the text to reflect on their own lives, on the lives of others, or on the human condition in general. In non-fiction, readers use the text information to rethink information they already know.

- *Stepping out and going beyond*. Readers distance themselves from the text and assume a critical stance, judging the text and relating it to other texts or experiences.

As readers construct their understanding of the text, interpretations are often not possible. In fact, as Norris and Phillips (1987) suggest, the essence of critical reading is raising alternative interpretations, weeding out interpretations to the extent that available information will allow, and then remaining with multiple possibilities. In their view, literary thinking is a complex reasoning process that involves analysing, synthesising, reformulating, linking, and generalising ideas.

Therefore, in evaluating students, we can no linger simply judge whether or not the reader's conclusions are similar to the teacher's or to those of the writer of the test. Instead, what is more important is the quality of the reader's argument or justification.

The Role of the Meta-Reader (The Successful Reader)

Pearson et al. (1992) synthesise research about reading comprehension processes into a set of seven strategies that consistently surface as a part of the repertoire of the successful reader. Successful meta-readers are those who:

- Search for connections between what they know and the new information they encounter in the texts they read.
- Monitor the adequacy of their models of text meaning
- Take steps to repair faulty comprehension once they realise they have failed to understand something
- Learn early on to distinguish important from less important ideas in texts they read.
- Are adept at synthesising information within and across texts and reading experiences
- Draw inferences during and after reading to achieve a full integrated understanding of what they read
- Sometimes consciously, and almost always unconsciously, ask questions of themselves, the authors they encounter, and the texts they read.

As can be concluded from these strategies, both schema theory and metacognitive awareness are foundations for understanding the comprehension process. Of the seven strategies of the successful meta-reader, I have chosen to elaborate on three fundamental strategies that seem to me to be most relevant to the message of this research: (1) Successful meta-readers use existing knowledge to make sense of text; (2) Successful meta-readers monitor their comprehension throughout the reading process; and (3) Successful meta-readers ask questions.

Successful meta-readers use existing knowledge to make sense of text

While reading, successful readers use prior knowledge to evaluate the adequacy of the meaning they have developed. An impressive body of research (fully explored in the previous chapter) points to the importance of prior knowledge in text comprehension. Research clearly indicates that successful readers use prior knowledge to help make sense of text while poor readers often do not. Poor readers can be taught to use, and

even to adapt, their prior knowledge, and when they learn to put such knowledge to use, their comprehension improves. Specifically, studies have demonstrated that:

1. Students with greater prior knowledge comprehend and remember more (Brown et al. 1978; Pearson et al. 1979).
2. Merely having prior knowledge is not enough to improve comprehension; the knowledge must be activated, implying a strong metacognitive dimension to its use (Bransford & Johnson 1972).
3. Young readers and poor readers often do not activate their prior knowledge (Paris & Lindauer 1976).
4. Good readers use their prior knowledge to determine the importance of information in the text (Afflerbach 1986).
5. Good readers use their prior knowledge to draw inferences from and elaborate on text (Hansen & Pearson 1983).

Successful meta-readers monitor their comprehension throughout the reading process

Meta-readers monitor their state of learning; they plan strategies, adjust effort appropriately, and evaluate the success of their on-going attempt to understand. A fundamental aspect of a meta-reader's metacognition is the ability to monitor the current state of the on-going attempt to read/learn/understand and to create new knowledge. This ability depends on the reader's knowledge of four major factors: text, task, strategy, and learner characteristics. All of these influence the degree to which a meta-reader will be able to co-ordinate plans and engage in active monitoring, which in turn will lead to successful reading and studying outcomes. Research has provided insight into what successful meta-readers specifically do before, during and after reading.

Before reading, successful readers consider what the text is going to be about, what they already know about the topic and the text, and what specifically they are looking for as they read. *While reading*, meta-readers ask themselves many questions: Does the meaning they are developing make sense? What might come next? Are they using the right background information? What might they do to understand better? *After reading*, meta-readers decide if they have successfully read the text, whether they should go

back and examine specific parts of the text, or whether they should reread for different purposes using a different strategy.

Metacognitive awareness of (a) the basic strategies of reading and studying; (b) simple rules of text construction; (c) differing demands of a variety of tasks, and (d) the importance of using any background knowledge, are all prerequisites to self-regulation. Basically this metacognitive awareness is the ability to monitor and check one's own cognitive activities while reading/studying/understanding and creating new knowledge (Baker & Brown 1984a, 1984b; Brown et al. 1983).

Successful meta-readers ask questions

Whenever students are engaged in a process of generating questions throughout reading, they are involved in active comprehension. Nolte and Singer (1985) explain that teachers can show students how to generate their own questions for a story by adhering to a 'phase-in, phase-out' strategy. Phase-in, phase-out refers to gradually shifting the burden of responsibility for question-asking from the teacher to the students. A good deal of this strategy involves modelling question-asking behaviour and making students aware of the value of questions before, during, and after reading. Self-questioning as a monitoring strategy helps students to set a purpose for reading and to direct the reading behaviour. Asking questions involves readers in the process of predicting, verifying, judging and extending thinking about the text materials, and builds critical awareness of the reader's role and responsibility while interacting with the text.

Palincsar and Brown (1984) provide additional strong evidence for the effectiveness of student-generated questions. In a series of studies, they trained junior high school students in four important learning strategies: summarising, questioning, clarifying, and predicting. Careful modelling in the form of a teacher-student pair was established to train students how to ask good questions. The researchers reported impressive effects for their instructional intervention program.

Figures 4 and 5 below sum up the discussion of the metacognitive components of reading and studying and the role of successful (meta) readers (based on Brown 1980, 1982a, 1982b; Pearson 1993; Pearson et al. 1992).

1. The reader consciously intends to control the reading act (a metacognitive experience) - create a focus.
2. The reader establishes the goal of the reading act - a purpose, reason(s) for doing it.
3. The reader mentally reviews prior knowledge of author, topic and skills; considers reading rate.
4. The reader makes predictions/hypothesis about:
   (One) content and text structure
   (Two) type of responses indicated by the questions (such as compose/construct, detail)
5. The reader begins to construct an idea about text content and its relation to prior knowledge.
6. The reader recalls prior knowledge of reading - learning strategies.
7. The reader focuses on his/her own metacognitive knowledge (a metacognitive experience)
   (One) knowledge of her/his cognitive processes
   (Two) knowledge of the demands imposed by different reading goals and different types of reading material.
8. The reader strategically plans the regulation and monitoring of the reading act
   (One) Consideration of metacognitive skills and strategies:
   Reading, skimming, summarising
   Paraphrasing, predicting
   Looking for important ideas
   Testing one's understanding
   Discovering what is still unknown
   Designing a possible structure or method for approaching the topic
   Considering application to other situations- further concept into long term memory
   Identifying the pattern of text
   Sequencing
   Looking for relationships
   Reading ahead for clarification
   Mentally executing the directions
   Relating new knowledge to prior knowledge
   (Two) Selection of metacognitive skills and strategies.
   (Three) Implementation of the skills and strategies.
9. Periodic assessment of reading success (a metacognitive experience).
   (One) Evaluate comprehension
   (Two) Identify important information
   (Three) Engage in review of other fix-up strategies
   (Four) Evaluate process
   (Five) Monitor need for further action

Figure 4: Metacognition and the Reading Process

Meta-components	Meta-reader
Plan	*What am I doing?* *Why I am doing it?* *Why is it important?* *What kind of text is this?* *What do I already know?* *What do I expect to learn?* *What do I need to do when I am done?*
Strategy	*How/Where does this fit in with I already know?* *What questions do I have?* Sets purpose according to: (One) prior knowledge (Two) author's intent (Three) task demands (Four) lesson objective
Monitor	*Do I need a specific plan to understand or learn about this?* *How effective have I been in this process?* *Do I need to do more?* Uses prior knowledge to: (One) predict (Two) make inferences (Three) note new learned information (Four) ask questions Detects unclear text fix up Elaborates/Summarises
Evaluate	*How can I use this information in other areas of my life?* *What did I learn?* *Was I able to meet the demand of the task?* *How do my responses differ from others?* *When should I read like this again?*

Figure 5: The Role of the Meta-reader

Being aware of the different kinds of prior knowledge, and the need to use this knowledge in the process of understanding/constructing meaning and creating knowledge from written text, are essential parts of the reading process (Figure 4 - # 3, 4, 5, 6, 7, 8, 9) and at the heart of every mindful activity of the learner (Figure 5 - Plan, Strategy, Monitor, Evaluate). Basically, we can say that in every mindful reading

activity, prior knowledge plays a significant role that makes the difference between success and failure in any cognitive task. In other words, successful meta-readers use existing knowledge to make sense of text (figure 4 - # 3, 4, 5, 6, 7; Figure 5 - Plan, Strategy, Monitor & Evaluate). Successful meta-readers monitor their comprehension throughout the reading process (Figure 4 - # 1, 2, 7, 8, 9; Figure 5 - Plan, Strategy, Monitor & Evaluate). Successful meta-readers ask questions (Figure 4 - # 1-9; Figure 5 - Plan, Strategy, Monitor & Evaluate). The fundamental purpose of the metacognitive awareness guidance (MCAG) in this research is to raise the metacognitive awareness of learners regarding their prior knowledge: both specific prior knowledge (text-specific and topic-specific) and overall prior knowledge before they engage in processing their assessment tasks.

The principles driven from metacognitive theory and the schema theory are the set of rules and guidelines used in designing the Metacognitive Awareness Guidance.

Chapter II: Empirical Framework

This chapter is organised into four main sections: the kits of assessment tasks collection, the design of metacognitive awareness guidance, the assumptions and hypotheses of the study, and the research design and methodology. The first two sections relate to two fundamental instruments of the research - the written Metacognitive Awareness Guidance (MCAG) and the three assessment tasks taken from the KATs.

The Kits of Assessment Tasks (KATs) Collection

In this study, the influence of metacognitive learning principles on learners' level of performance and achievements in reading assessment tasks is examined. For that purpose, the study makes use of actual learning assessment tasks, developed, tested, and currently being implemented by the Israeli Ministry of Education.

Being in a position to take advantage of materials which are actually in use in the educational system is one of the strengths of this research. The fact that the effect of the research treatment can be assessed on authentic materials, rather than on materials developed specifically for research purposes, adds significantly to the level of integrity of the results and implications of the research. Furthermore, the opportunity to integrate and implement lessons learned from the experiment into an existing program cannot be ignored.

For this research, three reading assessment tasks were chosen - "How Paper is Made", "The End", and "We Dream" (Appendices B, C and D, respectively) - and implemented without any changes or modifications. The assessment tasks were graded using the criteria dictated by their developers (Appendices P, Q and R, respectively).

This chapter will present the Kits of Assessment Tasks (KATs) in reading, their background, principles, characteristics and means of implementation. The description is presented from the point of view of the developers, and relies on four primary sources:

- Inbar, E. (1995) *The Assessment Task Collection of Reading and Writing: Principles, Aims and Teacher Instruction*. Jerusalem: The Ministry of Education (in Hebrew).
- Special Circular No. 4 (1996) The General Director of the Ministry of Education (in Hebrew)
- Lewy, A. (1996) 'Post-Modernism in the Field of Achievement Testing', *Studies in Educational Evaluation*, 22, 120-142.
- Lewy, A. (1997) *Alternative Assessment - Theory and Practice: A Collection of Cases and Reflective Comments*. Tel Aviv: Mofet Institute Press, p. 11-37, 85-106 (Hebrew with English abstract).

The Context

In 1992, Israel's Ministry of Education decided to set up a two-branched feedback system which focused primarily on examining cognitive educational achievements and included (i) the school-level feedback system (*mashov beit-sifri*), and (ii) the nation-wide feedback system (*mashov artzi*).

At least four factors contributed to this call for assessment reform:

1. The teacher's increasing authority in the area of evaluating achievement: "The teacher has moved to center stage as an actor in the assessment rather than being a simple administrator of 'better' tests" (Gipps 1994: 10).
2. Increasing questioning of the relevance of certain psychometric principles for evaluating educational achievement, and the applicability of current methods of recording performance and reporting credit.
3. Criticism by parents, educators and educational researchers of multiple-choice tests administered to the whole school population, at specified age-groups, for the purpose of measuring educational results.
4. Disapproval by the Ministry of the growing tendency to rank schools on the basis of achievement test results. Such ranking stigmatises schools with a large percentage of low socio-economic background or immigrant children, even where those schools have done a very good job in dealing with the needs of that population.

On the basis of these considerations, the Israeli Ministry of Education adopted the approach of the National Assessment of Educational Progress (NAEP), now in operation in the United States (Phillips & Walberg 1994), and decided to base national standards on tests given only to samples of students and not to the entire population. At the same time, it established a school-based feedback system to help teachers carry out formative evaluation at the school level. As the major part of the school-based feedback system, it was decided to develop Kits of Assessment Tasks (KATs) and distribute them among schools.

To initiate the process, the Ministry of Education issued a request for information through tender, seeking proposals to develop collections of assessment tasks in major school subjects. The assessment tasks were defined as materials to be used by teachers while monitoring learning in classroom and for the evaluation of educational achievement. The guidelines were in accordance with principles of alternative assessment as described in the professional literature, and as implemented in some schools that had already adopted alternative assessment practices.

The tender used descriptive terms, such as "representing authentic student needs", "divergent thinking", "originality", "relevance to actual life", "dealing with day-to-day life" and "promoting higher levels of thinking". It did not, however, suggest the conceptual definition of the alternative testing.

The requirement specified in the tender was the development of "Kits of Assessment Tasks" (KATs) for school subjects at a specific grade level. The tender indicated that a unit, or Kit, should contain approximately 30 assessment tasks, comprising altogether about 300 items. Tasks should be piloted on a small representative sample of the target population, and a scoring rubric developed, based on an analysis of students' answers. The tender also defined a professional evaluation team to assess the proposal.

After the evaluation process, the Ministry of Education contracted two teams to develop the KATs - one at the Tel Aviv University, and the second at the Centre for Educational Technology. Since the budget was limited, priority was given to upper grades of the primary school in language arts (mother tongue), mathematics, science, social studies and Jewish studies. Teams that included curriculum experts and teachers

experienced in preparing materials developed the assessment tasks. A feedback system, which included a steering committee, randomly selected schools and classes, and experienced teachers, was established to supervise the construction of scoring keys and the processing of the scores.

The structure, principles and characteristics of the KATs

Each Kit of Assessment Tasks is assembled in a folder containing up to 40 tasks in one subject for one grade level. Each folder is accompanied by a teacher's guide containing a brief explanation of the nature of the tasks, a scoring rubric and information about the results derived from the pilot. Each kit contains a rationale, as well as details about its major sections. For example, the KAT for "reading comprehension and writing for grade 4" has the following major sections: Literary text (16 tasks), Informative text (7 tasks), Media excerpts (7 tasks), a "do it" type text or guidelines for preparing something (3 tasks), Visual texts (2 tasks), Classical texts from ancient Jewish heritage (2 tasks).

In 1996, the first folders containing collections of assessment tasks were released for trial in grade 4 of the primary schools. These collections are intended to serve as a resource or task bank from which teachers can draw assessment tasks for evaluating student attainment in their own classes. The collections of assessment tasks can also serve as examples for teachers wishing to develop their own tasks. The developers emphasised that "the tasks in the collection are likely to serve the teachers in different ways and for various goals: as a testing tool, to plan teaching activities in accordance with student's needs, as a feedback tool, and as a follow-up element within the student's annual portfolio" (Inbar 1995: 4). It was anticipated that classroom tests administered during the school year would incorporate tasks prepared by the development teams, as well as items devised by the teachers.

Teachers could use the collection of the assessment tasks at their own discretion, and would not be required to report on the scope of use, nor would they be asked to provide information about the scores obtained in their classes.

According to Lewy (1997), the tasks in the collection are "authentic", "challenging" and "attainable" (25-30). They are *authentic* in that they aim to model real learning

activities taken from real contexts (within the students' immediate environment in space and time), which come from authentic sources and are presented in their original form. In other words, an authentic task is one which is useful, worthy, meaningful to students, and focuses on students' ability to use the knowledge and the skill learned. The assessment tasks in the collection reflect the ability of the student "to cope with authentic unseen texts of various levels of difficulty and complexity among the existing inventory of texts in the students' cultural environment" (Inbar 1995: 2).

A *challenging* task is defined as a task that provides a cognitive, social or personal challenge, preferably using open-ended questions rather than multiple-choice items. In open-ended questions, students perform complex tasks: they formulate answers, carry out operations and describe them, express ideas in their own words, collect data, integrate data drawn from various sources, justify statements, interpret differences in approaches, identify advantages and disadvantages of a given action - in short, students use their minds.

Attainable tasks are those that have been tried out on a representative sample of the target population. Results have shown empirically the feasibility of attaining the prescribed learning objectives. Thus, it is unlikely that student failure be the result of setting an inappropriate target for the test population, lack of clarity, or other aspects related to the task itself.

The developers of the KATs suggested a scoring guide for each of the assessment tasks in the collection. The scoring guide is one of the ways to deal with lack of consensus among evaluators. Items are generally graded on a scale of one to three. When a yes/no answer is called for, the score is either 0 or 3 (0 = wrong, 3 = correct). When longer answers are required, criteria are provided for each score, As a rule, there is no need to give an overall mark for the entire paper. It is enough to score each item separately in order to construct a profile of student performance on various types of items.

The scoring guide is differential. For instance, a comprehension task which tests the ability to make generalisations will assess and grade only generalisation, without relating to the written expression such as problems of phrasing or spelling. Written tasks allow for assessment in accordance with types of expression. For instance, in

assessing a story, different considerations will be employed than in assessing criticism or drawing conclusions. The authors recommend giving separate grades for handwriting, spelling, punctuation, and presentation of ideas. Grading will therefore be performed along several dimensions and each item will be given a separate mark, as opposed to the traditional overall mark (Inbar 1995: 8).

Consequently, it has been recommended that scoring guides be developed on the basis of empirical study of a small number of examination papers. The scoring guides should emphasise the need for careful scrutiny to determine the merit of answers different from those provided in the scoring guide. The conclusion of the developers is that while there are ways to reduce the magnitude of error in the process of scoring, teachers need to be aware that there is no way to ensure that scores be completely error-free.

Maintenance of the KATs

The developers note that the collection requires on-going maintenance: "Without maintenance, the collection will deteriorate over time, and lose its freshness" (Lewy 1996: 121). To prevent this, they suggest two mechanisms:

1. The collection of assessment tasks should be regularly supplemented with new and innovative tasks. New items should be add to the collection, not only to replace those that have been over-used, but also to ensure that the collection keeps pace with changes occurring in the curriculum over time.

2. The collection of assessment tasks should have a support mechanism to assist the teacher who uses it. This mechanism should deal with the following issues: helping teachers to compile tests, assign grades, add tasks to the collections and develop new tasks suitable for locally-developed curriculum units. It also should assist teachers in carrying out statistical analysis and using test results to improve students' achievement.

The mechanism of maintenance requires adapting all elements of the support mechanism to changing conditions in teaching and assessment practice in schools. It also requires co-operation among users, discussion of experiences related to the

collection, absorbing new approaches and theories emerging in the field of assessment, extending the user group, and checking the effectiveness of the collection.

I will conclude this discussion of the KATs using the aspects of the model that reflect the sequence of actions related to operating systems of collections of assessment tasks suggested by Lewy (1996). The key aspects are:

- Developing assessment tasks for the collection
- Using the collection for constructing classroom tests
- Determining principles for assigning scores
- Assigning scores
- Taking advantage of test results for improving teaching in schools
- Communicating with students, teachers and public groups interested in education
- On-going maintenance of the task collection

Metacognitive Awareness Guidance (MCAG)

> *We...are striving to discover not how the child came to be what he is, but how he can become what he is not yet.* Vygotsky 1978
>
> *What children can do with the assistance of others is even more indicative of their mental development than what they can do alone.* Vygotsky 1978

The inspiration and rationale to combine written Metacognitive Awareness Guidance (MCAG) with a learning assessment task, was influenced by Vygotsky's notion of a "zone of proximal development" (Vygotsky 1978; Moll 1990). Vygotsky argued that one cannot understand the child's level of development unless one considers two aspects: the actual development level and the potential development level. "The zone of proximal development is the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" (Vygotsky 1978: 86).

He argued that measuring the level of potential development is just as crucial, if not more so, as measuring the level of actual development. In assessing a learner's performance and outcomes, the importance of conducting a separate analysis of the potential level of development derives from the fact that it may vary independently of the actual level. Vygotsky illustrated this point as follows:

> *Imagine that we have examined two children and have determined that the mental age of both is seven years. This means that both children solve tasks accessible to seven-years-olds. However, when we attempt to push these children further in carrying out the tests, there turns out to be an essential difference between them. With the help of leading questions, examples, and demonstrations, one of them easily solves test items taken from two years above the child's level of [actual] development. The other solves test items that are only a half-year above, his or her level of [actual] development* (in Wertsch 1985: 68).

Given this set of circumstances, Vygotsky asked whether the mental development of these two children was the same (in Wertsch 1985: 68) and argued that in an important sense they were not:

> *From the point of view of their independent activity they are equivalent, but from the point of view of their immediate potential development they are*

sharply different. That which the child turns out to be able to do with the help of an adult points us toward the zone of the child's proximal development. This means that with the help of this method, we can take stock not only of today's completed process of development, not only the cycles that are already concluded and done, not only the processes of maturation that are completed; we can also take stock of processes of maturation that are not completed; we can also take stock of processes that are now in the state of coming into being, that are only ripening, or only developing (in Wertsch 1985: 68).

From this illustration, I drew the general conclusion which served as a major guideline for developing and using Metacognitive Awareness Guidance (MCAG) in my research: performance must be assisted, and assisting performance by combining a 'psychology tool'[1] and a 'stimulus'[2] with an assessment task will make a difference in the learner's performance and outcomes (Brown & French 1979; Brown & Ferrara 1985; Campione et al. 1991).

The 'stimulus' or the 'scaffold' given the learners became, in time and with social support, part of the learner's repertoire of understanding. In Vygotsky's formal language, understanding means moving from the 'interpsychic' plan to the 'intrapsychic' plan. Implicitly, what we are first able to do with others, we are eventually able to do by ourselves.

In my research, the 'stimulus' - the written MCAG - provides the assistance of 'others' in situations where learners are encouraged to perform activities more 'mindfully' and 'meaningfully', before attempting to process the assessment tasks.

The written MCAG affords learners the opportunity to engage in higher order operations: to test their knowledge, discover new links, anticipate, raise questions,

---

[1] In Vygotsky's words, a 'psychology tool' serves "as a conductor of humans' influence on the object of their activity. It is directed towards the external world; it must stimulate some changes in the object; it is the means of humans' external activity directed towards the subjugation of nature" (Vygotsky 1960, in Wertsch 1985: 78).

[2] In a report presented by Vygotsky in 1934 he expanded on the term 'psychology tool' as follows: "The following can serve as examples of psychological tools and their complex system; language, various systems of counting; mnemonic techniques; algebraic symbol systems; works of art; written language; schemes; diagrams; maps and mechanical drawings or sorts of conventional signs" (Vygotsky 1981, in Wertsch 1985: 79).

suggest possible answers, etc. As such, the MCAG functions in the 'zone of proximal development', and addresses the learner's potential level of development.

The written MCAG is based on Vygotsky's theory and should lead to internalisation[3] of the guidance. This perception introduces the general anticipation of my research, that increasing learners' metacognitive awareness by means of well-planned guidance, built on prior knowledge, will not only facilitate their learning and improve its outcomes on a specific assessment task, but will also increase their chances of internalising the guidance components and applying them in changing learning situations.

The design of the written metacognitive awareness guidance in this study is based on four main **resources**:

1. The relevant theories of cognitive psychology, dealing with metacognitive skills, and their functions and roles in understanding, learning, constructing new meanings, creating new knowledge and solving problems ("reading has it all").
2. The relevant research that put these principles to work, designed to evaluate the effect of metacognitive skills on learner performance and achievements.
3. My pedagogical-didactic experience over the last fifteen years, teaching language arts in the elementary school and specifically during the last seven years which were devoted to research, implementation and integration of metacognitive skills into the language arts curriculum.
4. Hours of on-going dialogue in the framework of the 'Special Committee for Research in Process of Texts' (SCRIPT), in which I have participated actively for the last seven years. SCRIPT is sponsored by the Israeli Ministry of Education and Ben-Gurion University.

The fundamental purpose of metacognitive awareness guidance in this study, is to raise the metacognitive awareness of learners regarding their prior knowledge (schema) before they engage in processing assessment tasks. Metacognitive awareness that plays a vital role in learning and understanding; metacognitive awareness that is

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[3] In Vygotskian meaning, internalization refers to a new level of behavioural organisation once possible only with the help of external mediators.

needed for any direct attempt to construct meaning and create new knowledge; metacognitive awareness that has an effect on learning performance and outcomes. Accordingly, I set up the metacognitive awareness guidance with the following **guidelines** in mind:

- To help learners become aware of what they already know about the topic of the assessment text before they receive the assessment task.
- To help learners concentrate on and invest mental effort in 'constructing' meaning rather than identifying 'correct' meaning, by focusing on what they already know and understand.
- To help learners make an active effort to construct meaning by predicting what the text may be about, by leading the learners to make judgements about how new information relates to what they already know, so that they can fit new pieces into the partially- assembled puzzle which already exists in their minds.
- To help learners focus on their existing knowledge by asking them to discover for themselves "what they already know about...", and direct this knowledge to their 'working memory'.
- To help learners build and create an 'advanced organiser' for the task by building bridges and making connections between existing knowledge and the ideas which are communicated in the text.
- To help learners activate schema by anticipating, raising questions, suggesting possible answers, and extending thinking about the task/topic/issue before "going to work on it".
- To raise the learners' awareness of:
  - ◊ their prior knowledge (schema) of the task
  - ◊ the role and function of prior knowledge in understanding and in answering the assessment task questions
  - ◊ the effect of the use of prior knowledge on their performance and outcomes
  - ◊ the active and dynamic nature of their existing knowledge and the need to re-examine this knowledge (vis-a-vis what they will read)

Metacognitive guidance is also designed to stimulate interest, arouse curiosity, and draw the learner into the assessment task. I chose an open-ended question format (which requires a written response) as opposed to multiple choice, because of its potential to drive the learner's metacognitive awareness. The written responses required by the open-ended questions stimulate learners to think about the topics, issues and problems, and enable the learner to integrate their schema into their thinking. Open-ended questions provide learners the opportunity to think for

themselves, and express their knowledge and ideas. Furthermore, open-ended questions

- call for learners to construct their own response instead of selecting a single 'correct' answer
- allow learners to demonstrate the depth of their understanding - almost impossible with multiple choice items
- encourage learners to think about the topic/issue/problem in many ways, and in their own style.

The MCAG addresses four main **principles** driven by the theoretical framework described above:

1. *Context Information* - building readiness by putting topics, issues, and subjects of assessment tasks into context.
   - by guiding learners to use context information such as author, resources, date of publication, and other world knowledge text-related information, thus piquing interest and raising expectations about the text
   - by creating a context in which the student will read with purpose and anticipation
2. *Building, creating, or discovering relevant schema* for the assessment task:
   - by focusing on what the learners already know and understand
   - by asking for the learners' opinions and views instead of choosing a single correct answer
   - by asking questions that 'assist performance'[4] rather than questions that 'assess performance'[5]
   - by offering relevant background knowledge about the text, topics, author, etc. - "building bridges and making connections"
3. *Activating the relevant schema* and extending thinking about the assessment task by anticipating, raising questions, suggesting possible answers, and extending thinking about the task - topic - issue before "going to work on it".
4. *Creating and raising metacognitive awareness* of:
   - prior knowledge (schema) of the task

---

[4] Based on the definition of Gallimore and Tharp (1990), the assessment question attempts to discover the level of the pupil's ability to perform without assistance.

[5] The assistance question, is intended to produce a mental operation that the pupil could not or would not produce alone. The assistance provided by the question lies in promoting that mental operation (Gallimore & Tharp 1990: 182).

- the role and function of prior knowledge in understanding and answering the assessment task questions
- the effect of using prior knowledge on their performance and outcome
- the active and dynamic nature of their existing knowledge and the need to re-examine this knowledge (vis-a-vis what they will read)

The MCAG employs direct explicit self-talk.[6] Learners are asked to use self-talk to monitor their activities and to establish meaningful connections with their MCAG activities. The instruction to stop and make an observation - reflect on - what they did, why they did it, and how to use what they did, breaks down their spontaneous tendency to 'start working' - to answer the question immediately. Through the use of self-talk, their processing of the assessment tasks will become less impulsive and more mindful.

[6] The use of self-direct-talk is a major theme in Vygotskian development theory. At one point, children begin to use language not only to communicate but to guide, plan, and monitor their activity. In Vygotsky's own words: "The specifically human capacity for language enables children to provide for auxiliary tools in the solution of difficult tasks, to overcome impulsive action, to plan a solution to a problem prior to its execution, and to master their own behavior" (Vygotsky 1978: 28).

The four MCAG principles vis-a-vis the MCAG activities

The MCAG implemented the four principles listed above by providing the following kinds of activities:

The first principle, *Context Information* - building readiness by putting topics, issues, and subjects of assessment tasks into context - was implemented as follows:

> The title of the passage you are about to read is **"How Paper is Made"**.
>
> In the passage, the writer describes the following:
> - How paper is made
> - What problem arises during the process of manufacturing paper
> - Solutions to the problem
>
> from - Metacognitive Awareness Guidance for assessment task 1 - "How Paper is Made" **(Appendix J: MCAG - 1)**

> You are about to read two different translations of the poem **"The End"**.
>
> The poem was written in English by **A. A. Milne**, writer of children's books and poems, and translated into Hebrew.
>
> from - Metacognitive Awareness Guidance for assessment task 2 - "The End" **(Appendix K: MCAG - 2)**

> The passage that you are about to read is from an Encyclopaedia and is called **"We Dream"**.
>
> from - Metacognitive Awareness Guidance for assessment task 3 - "We Dream"**(Appendix L: MCAG – 3)**

The second principle, *Building, Creating, or Discovering (BCD) relevant schema* for the assessment task - was implemented as follows:

Before reading the passage, please try to answer the following questions:

1. What do you think paper is made of? In my opinion, _____
   _____
2. What problem could there be when manufacturing paper? In my opinion,
   _____
3. What solution can you suggest to the problem that you raised? The solution, in my opinion, is _____
   _____

from - Metacognitive Awareness Guidance for assessment task 1 - "How Paper is Made" **(Appendix J: MCAG - 1)**

Yaacov Orland translated the poem in **1957.**

Ora Morag translated the poem in **1992.**

35 years passed between the first translation and the second one!!!

Yaacov Orland is 81 years old. He was born in Ukraine in 1914, and immigrated to Israel at the age of 7. He wrote and translated many songs, poems and plays. His style of writing has been described as "lyrical and melodious, with clear and neat rhymes".

In your opinion, will there be a difference between the first translation and the second one? What is the difference? I think that _____ because _____
_____

Ora Morag is 50 years old.

She was born in Haifa, Israel in 1943. For several years she was an actress. She has written and translated a number of books for children.

Her books have been described as "written in authentic children's language, with humour and free verse".

Do you think that these facts will influence the style of the translation?

Yes _____ No _____

from - Metacognitive Awareness Guidance for assessment task 2 - "The End" **(Appendix K: MCAG - 2)**

Before reading the passage, write 5 questions that you think will be answered in the passage **"We Dream"**:

1. _____ ?
2. _____ ?
3. _____ ?
4. _____ ?
5. _____ ?

from - Metacognitive Awareness Guidance for assessment task 3 -
"We Dream"**(Appendix L: MCAG – 3)**

The third principle, *Activating the relevant schema* and extending thinking about the assessment task - was implemented as follows:

Write a short paragraph to fit the title **"How Paper is Made"**, using the following words: **paper, wood, manufacture, recycle**

_____

_____

_____

_____

From - Metacognitive Awareness Guidance for assessment task 1 -
"How Paper is Made" **(Appendix J: MCAG - 1)**

Before reading the two translations, repeat to yourself:

The poem **"The End"** was written by _____. It was translated in the year _____, by _____ and therefore I expect the translation to be _____

The poem **"The End"** was written by _____. It was translated in the year _____, by _____ and therefore I expect the translation to be _____

From Metacognitive Awareness Guidance for assessment task 2 -
"The End" **(Appendix K: MCAG - 2)**

Of the five questions you have written, select **two**, and answer them. Write a **possible answer** to each question you chose.

a. I chose question number _____

b. In my opinion, the possible answer is _____

_____

c. I chose question number _____

d. In my opinion, the possible answer is _____

_____

The sentences below describe what you may read in the passage.

If you think that a sentence may be from the encyclopaedia, about the passage "**We Dream**", circle the word **Yes**. If, in your opinion, a sentence does not describe the passage, circle the word **No**.

1. This passage will tell about various dreams that children dream. **Yes / No**
2. This passage will present information about dreams. **Yes / No**
3. This passage will describe a scary dream that the author of the passage dreamed recently. **Yes / No**
4. This passage will describe strange dreams that people remember. **Yes / No**
5. This passage will present various facts about dreams. **Yes / No**
6. This passage will describe research on dreams and analysis of dreams. **Yes / No**
7. This passage will describe an unpleasant incident that happened to the author of the passage as a result of a dream he had. **Yes / No**

I think that the sentences I marked **Yes** describe the reading paragraph because

_____

From - Metacognitive Awareness Guidance for assessment task 3 - "We Dream"**(Appendix L: MCAG – 3)**

The fourth principle, *Creating and raising metacognitive awareness* of prior knowledge through direct-explicit instruction - was implemented through a direct-explicit instruction, and every learner in the experimental group was asked to repeat the words out loud before receiving the assessment task:

Now, before asking your teacher for the learning task, please say these words aloud:

Now I know more about manufacturing paper.

This knowledge will help me to understand the passage.

Now it will be easier for me to study the passage.

from - Metacognitive Awareness Guidance for assessment task 1 -
"How Paper is Made" **(Appendix J: MCAG - 1)**

Now, before asking your teacher for the learning task, please say these words aloud:

Now I know about the poet and the translators.

What I know about the poet and the translators will help me to understand.

What I know about the poet and the translators will help me to study.

from - Metacognitive Awareness Guidance for assessment task 2 -
"The End" **(Appendix K: MCAG - 2)**

Now, before asking your teacher for the learning task, please say these words aloud:

I know a lot about dreams.

Everything I already know helps me understand.

Everything I already know will help me to study the passage.

from - Metacognitive Awareness Guidance for assessment task 3 -
"We Dream" **Appendix L: MCAG - 3**

Research Assumptions

The following major **assumptions** are derived from the previous sections:

- Metacognitive awareness of prior knowledge accompanies the process of learning from a text and constitutes part of the reading behaviour used by the expert learners/readers: metacognitive awareness relates to proficiency in reading
- Metacognitive awareness of prior knowledge will determine the level of performance and outcome of any learning or assessment task.
- Students can be trained to be aware of the influence of their existing prior knowledge, and of characteristics of text, task, learning strategies, and of themselves as learners.
- The written MCAG affords learners the opportunity to engage in higher order operations: to test their knowledge, discover new links, anticipate, raise questions, suggest possible answers - and these operations will facilitate their learning and improve the outcomes on reading assessment tasks.
- The MCAG creates a 'zone of proximal development', and addresses the learner's potential level of development. It is based on Vygotskian theory and leads to internalisation of the guidance.
- Increasing learners' metacognitive awareness by means of well-planned guidance which builds on prior knowledge will increase learners' chances of internalization the guidance components and applying them in changing learning situations.

Research Hypotheses

With reference to the main assumptions, to the theoretical literature background, and to an analysis of relevant research performed, I designed a study (fully described in the following chapters) which utilised three modalities:

Group 1 - no treatment at all (control group)

Group 2 - placebo group (Content Instruction)

Group 3 - experimental group (Metacognitive Awareness Guidance)

Group 1 received three different assessment tasks (unchanged and unmodified) from kits of assessment tasks in reading (KATs - Appendices B, C, and D). *Group 2* received the same three assessment tasks, but was given the texts of the assessment tasks and the Content Instructions (CI - Appendices M, N, and O) before receiving the tasks. *Group 3* received the same three assessment tasks, but was first given written Metacognitive Assessment Guidance (MCAG - Appendices J, K, and L).

Seven hypotheses were tested in this study organised into three main clusters:

The ***first cluster*** of hypotheses relates to the three groups (control group, placebo group, and treatment group) and analyses the differences in the variables from a comparative point of view (i.e., 'between research groups').

The ***second cluster*** of hypotheses considers only the treatment group (group 3 - learners who received metacognitive guidance in addition to the assessment tasks). In this cluster, the performance of the learners on assessment tasks is analysed, while considering the influence and effect of the different elements of the metacognitive awareness guidance (i.e., 'Within sub-groups of the metacognitive awareness treatment group').

The ***third cluster*** examines how teachers of the treatment group view Metacognitive Awareness Guidance; their opinion of its role and effects on learner performance and the outcomes of learning tasks; and the influence of the experiment on daily learning and teaching in their classes. Teachers' reports will be used as one of the means of explaining and understanding the findings of the research.

Cluster I - 'Between Research Groups'

Hypothesis 1

Learners who received written Metacognitive Awareness Guidance in addition to the assessment task (learners of MCA treatment group 3) will exhibit a higher level of achievement in assessment tasks than learners who did not (learners of control group 1 and learners of the CI (content instruction and reading the passage before) placebo group 2).

***Hypothesis* 2**

Learners who received written Metacognitive Awareness Guidance in addition to the assessment task (learners of MCA treatment group 3) will show a higher level of metacognitive awareness (measured by the Metacognitive Strategy Index questionnaire - MSIQ - a questionnaire designed to measure learners' metacognitive awareness) than learners who did not receive the metacognitive guidance (learners of control group 1 and learners of the CI (content instruction and reading the passage before) placebo group 2).

***Hypothesis* 3**

Learners who received written Metacognitive Awareness Guidance in addition to the assessment task (learners of MCA treatment group 3) will report a higher level of mental effort (measured by the Mental Effort questionnaire (ME) - a questionnaire designed to measure learners' mental effort) invested during the processing of assessment tasks than learners who did not receive the metacognitive guidance (learners of control group 1 and learners of the CI (content instruction and reading the passage before) placebo group 2).

***Hypothesis* 4**

Learners who received written Metacognitive Awareness Guidance in addition to the assessment task (learners of MCA treatment group 3) will report a higher level of importance and effectiveness (measured by the Importance and Effectiveness questionnaire - IE) than learners who didn't receive the metacognitive guidance (learners of CI (content instruction and reading the passage before) placebo group 2).

Cluster II - 'Differences among sub-groups of the Metacognitive Awareness Treatment Group'

Hypothesis 5

In the treatment group (learners who received written metacognitive awareness guidance- MCAG - in addition to the assessment tasks), learners who show a high level of activation of relevant schemata will reach a higher level of achievement in the assessment tasks.

Hypothesis 6

In the treatment group (learners who received written metacognitive awareness guidance- MCAG - in addition to the assessment tasks), learners who show a high level of activation of relevant schemata will report on a high level of mental effort (ME) and a high level of importance and effectiveness (IE).

Hypothesis 7

In the treatment group (learners who received written metacognitive awareness guidance- MCAG - in addition to the assessment tasks), learners who show a high level of activation of relevant schemata will show a high level of metacognitive awareness according to the Metacognitive Strategy Index (MSI).

Cluster III - Additional observations and teachers' interviews

Additional research questions will examine the perspective and attitude of the four teachers whose pupils received metacognitive awareness guidance in addition to the assessment tasks.

Research Design and Methodology

Experimental design for theory-based research

Before describing and discussing the design and methodology of the research, I would like to make three points:

- This experimental research was conducted within the post-positivistic paradigm. In contrast to the positivists who believe that one reality exists and that is the researcher's job to discover that reality (Guba & Lincoln 1994), the post-positivists concur that a reality does exist but that it can be known only imperfectly because of the human limitations of the researcher. They thus express critical realism, as opposed to the naive realism of positivists and believe that researchers can discover 'reality' only within a certain realm of probability. They cannot 'prove' a theory, but they can make a stronger case by eliminating alternative explanations (Reichardt & Rallis 1994).

- The research was conducted to test hypotheses derived from theories of learning, metacognition, schema and the Vygotskian 'zone of proximal development'. If the results are found to be consistent with the hypotheses, my conclusion is that the experiment supported these theories, but not they are necessarily more valid than other theories.

- I agree with the approach that holds that the experiment is the most powerful research design currently available for testing hypotheses about cause and effect relationships between variables. Yet the experiment may not be a perfect method; even the findings of a well-designed experiment are potentially refutable.

Considering these points, I would like to conclude by quoting Karl Popper, the philosopher of science: "But what, then, are the sources of our knowledge? The answer, I think, is this: there are all kinds of sources of our knowledge, but *none has authority*...I do not, of course, deny that experiment may also add to our knowledge, and in a most important manner. But it is not a source in any ultimate sense" (Popper 1968: 24).

With reference to the main assumptions, to the theoretical background, and to an analysis of relevant research performed, I designed an experimental research (fully

described in the following chapters) to test the effect of metacognitive awareness guidance on students' achievements and performance in three assessment tasks taken from the Israeli KATs in reading. This research utilised three modalities: Group 1 - no treatment at all (control group), Group 2 - content instruction (placebo group) and Group 3 - metacognitive awareness guidance (treatment group).

Group 1 received three assessment tasks (unchanged and unmodified) from the Kits of Assessment Tasks in reading (KATs - Appendices B, C and D).

Group 2 received the same three assessment tasks, but was asked to read the texts and the Content Instructions (CI - Appendices M, N and O) before receiving the tasks.

Group 3 received the same three assessment tasks, but were first given written Metacognitive Assessment Guidance (MCAG - Appendices J, K and L).

Seven specific hypotheses were tested in this study. I distinguish between three main clusters of hypotheses:

The ***first cluster*** of hypotheses relates to the three research groups (control group 1, CI placebo group 2, and MCA treatment group 3). It analyses the differences in the variables from a comparative point of view (e.g., 'between research groups').

The ***second cluster*** of hypotheses considers only the MCA treatment group (group 3 - learners who were given the metacognitive guidance in addition to the assessment tasks). In this cluster, the performance of the learners on reading assessment tasks is analysed. This is done while considering the influence and effect of the different elements of the metacognitive awareness guidance (e.g., 'Differences among sub-groups of the metacognitive awareness treatment group').

The ***third cluster*** examines how teachers of the MCA treatment group view Metacognitive Awareness Guidance; their opinion about its role and effects on learner performance and the outcomes of learning tasks; and the influence of the experiment on daily teaching and learning in their classes. I will use the teachers' reports as one of the means of explaining and understanding the findings of the research. The above is a simplified description of the research design. The actual process of designing a research study is more complex. David Krathwohl (1985) developed a model of a research design that reflects this complexity. His model specifies a sequence of steps

and links that form a "chain of reasoning". Figure 6 illustrates Krathwohl's chain of reasoning model. It is depicted as a series of links to convey the notion that each step in the process of testing knowledge is dependent on the soundness of the preceding step. Also, each step in the chain must follow logically from that which precedes it, or the total research design is weakened.

The nine steps of the "chain of reasoning" provide me as a researcher with a tool, disassociated from any specific content or paradigm, which enables me to examine the logical structure of the research in order to determine the potential of the research to test whether the knowledge claim is valid in the particular situation observed, and if it is likely to hold true in other situations (generalisability). The nine steps of the reasoning chain are listed below (Krathwohl 1985: 42):

Step 1 *Conclusions from previous studies* - the first step in designing a research study is to review previous research findings (in this research, Chapter 1 - Conceptual Framework).

Step 2 *Explanation, rationale, theory or point of view* - a knowledge claim gains credibility if it is grounded in a plausible rationale rather than coming out of "the clear blue sky" (in this research, Preface, Conceptual Framework, Empirical Framework).

Step 3 *Questions, hypotheses, predictions, models* - the next step in testing a knowledge claim is to state it in a form that can be tested and that is related to the previous steps in the "chain of reasoning" (in this research, Assumptions and Hypotheses).

Step 4 *Design of the study* - this step in the "chain of reasoning" involves the design of the empirical test of the knowledge claims. The design needs to be sound otherwise the results of the test will be rejected (in this research, Sampling, Variables, Treatment and Materials, Procedure, Measures).

Step 5 *Gathering the data* - once the empirical test has been designed (step 4 above), it must be carried out.

Steps 6 & 7 *Summarising the data and determining the statistical significance of the results* - in quantitative research, as the term implies, the data are in numerical form (in this research, Findings).

Step 8 *Conclusion* - the researcher must examine the results of the data analysis and decide whether the knowledge claim is supported or not (in this research, Discussion and Conclusions).

Step 9 *Beginning the next study* - once a study is completed, it is reported in some form and thereby becomes part of the research literature (in this research, Summary and Recommendations).

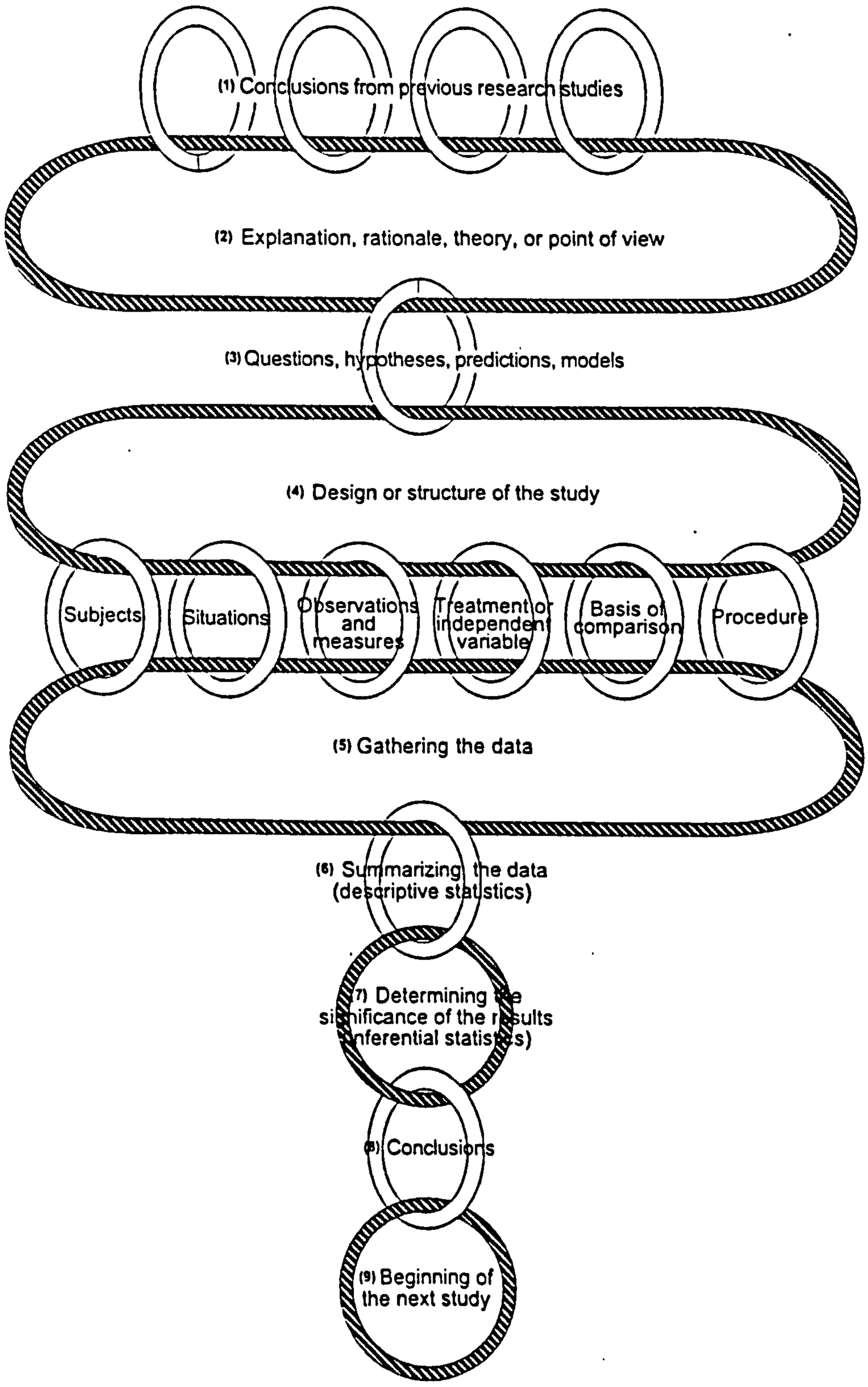

Figure 6: Krathwohl's Chain of Reasoning

Krathwohl's chain of reasoning model demonstrates the critical importance of each step in designing and carrying out a quantitative research study and interpreting the data it generates. Although Krathwohl's model primarily refers to quantitative research

design, he notes that it also can be applied, with modifications, to qualitative design (1985: 42). The model also demonstrates that the process of formulating and testing knowledge claims involves personal judgement, interpretation, creativity and rational persuasion at each step.

Within the post-positive paradigm, this chapter - Research Design and Methodology - is summarised in accordance with the main categories, which typically characterise a report of such research:

- ***Subjects*** **(*sampling*)** refers to the process of selecting a sample from a defined population with the intent that the sample represents the target population. In this research the population comprises 4th grade pupils in four elementary schools in Israel. The sampling procedure specifies the type of sample, sample size, geographic area, gender and socio-economic status.
- ***Measured Variables and Instruments*** refer to three types of research variables: control variables, experimental variables and dependent variables and to the way that the research variables are measured and validated.
- ***Treatments and Materials*** refer to the three assessment tasks taken from the KATs, and to the tools which were developed for this research - the Metacognitive Awareness Guidance for the treatment group, and the Content Instruction for the placebo group.
- ***Procedure*** refers to major steps in the research process and is basically a description of steps and actions taken in conducting the research.
- ***Data Collection and Analysis*** refer to the instruments used to collect the information and to the different statistical methods used to determine the statistical significance of differences among the groups.

Sampling

A total of 300 4th grade pupils (160 boys, 140 girls) from 4 different schools in the greater Tel-Aviv area (a total of ten 4th grade classes) participated in the research. Distribution of the population by groups, schools and classes is presented in Table 1.

Table 1: Distribution of Population by Groups and Schools (N = 300)

Research Group / School	**Group 1 –** Control Group	**Group 2 – CI** Content Instruction	**Group 3 – MCAG** Metacognitive Treatment	**Total**
School 1 **G**	$N_{1G} = 32$ (1-32)	$N_{2G} = 32$ (103-134)	$N_{3G} = 31$ (188-218)	95
School 2 **K**	$N_{1K} = 30$ (33-62)	$N_{2K} = 29$ (135-163)	$N_{3K} = 27$ (219-245)	86
School 3 **BR**	$N_{1Br} = 40$ (63-102)	----	$N_{3Br} = 35$ (246-280)	75
School 4 **BL**	----	$N_{2Bl} = 24$ (164-187)	$N_{3Bl} = 20$ (281-300)	44
Total	$N_1 = 102$	$N_2 = 85$	$N_3 = 113$	300

Two of the schools are located in an upper middle class neighbourhood (Schools G and BR) and the two other schools (K and BL) are located in a lower middle class neighbourhood. The sample included 170 pupils in five classes in schools G and BR, and 130 students in five classes in schools K and BL. Classes were randomly assigned to the three research groups. In schools G and K, where there were three 4th grade classes, one was randomly assigned to each of the research groups (control, placebo, experimental). Since it had previously been decided that each school would have an experimental group, and because schools BR and BL had only two 4th grade classes, in each school one class was randomly assigned as the experimental group and the second as one of the two other research groups (control or placebo). The pupils were clustered into three groups:

- $N_1 = 102$ pupils in the control group (Group 1 - no treatment)
- $N_2 = 85$ pupils in the Content Instruction group (Placebo group 2 - CI)
- $N_3 = 113$ pupils in the Metacognitive Treatment group (Treatment group 3 - MCAG)

For six reasons, the strategy used for selecting the research participants was 'convenience sampling' (Henry 1990; Gall, Borg & Gall 1996; Mertens 1998). The sample included:

1. pupils in the 4th grade of elementary school as this was the level targeted by the Chief Scientist of the Israeli Ministry of Education when developing the KATs in reading.
2. only schools which had not been selected as trial schools for initial implementation of the KATs in reading.
3. schools which were elected to implement the KATs the following year, thereby encouraging their cooperation.
4. schools which were located in various socio-economic areas to generate a diversified pupil population.
5. schools located in the urban centre of Israel, where approximately 50% of the pupil population resides.
6. schools which were relatively accessible, because the research procedure required at least 10 visits to each school.

Measured Variables and Instruments

The research comprised an experiment to determine the effect of the Metacognitive Awareness Guidance (MCAG) on 4th grade pupils' achievement on reading assessment tasks. The experiment involves manipulation of the treatment variables and subsequently observing the effect of this manipulation on the dependent variables. The research employs three types of variables – *treatment variables, dependent variables* and *control variables*.

Treatment variables (also known as 'independent variables', 'experimental variables' or 'intervention variables') refer to the three research modalities: Group 1 - no treatment at all (control group), Group 2 - content instruction (CI - placebo group) and Group 3 - metacognitive awareness guidance (Treatment group). These are fully described in the following section – **Treatments and Materials.**

Dependent variables (also known as 'post-test variables' or 'criteria variables') are the variables measured to determine the effect of the treatment. The dependent variables are measures of pupils' achievements on each of the three reading assessment tasks (Paper, End and Dream), pupils' scores on the Mental Effort (ME) questionnaire, on the Importance and Effectiveness (IE) questionnaire, and on Metacognitive Strategies

Index questionnaire (MSIQ). These dependent variables were measured after the subjects had undergone the intervention.

Control variables in this research are clustered into two groups. The first group is control variables used to compare the various treatment groups (research groups 1, 2 and 3). These basically reflect pupils' reading comprehension level and the teachers' evaluation of pupils' reading and writing performance prior to the experiment.

The second group of control variables are used to compare sub-groups of the MCA treatment group 3. These refer to pupils' scores on MCAG 1, 2, and 3 (for reading assessment tasks 1, 2 and 3, respectively).

Controlling these factors strengthens the experiment's 'cause and effect' relationship. The measured variables of the research are presented in Table 2.

Table 2: Measured Research Variables

Control Variables		*Reading test score* *Teacher's grade - reading / writing* *Gender* *Score on MCAG assessment task 1 (MCAG-1)* *Score on MCAG assessment task 2 (MCAG-2)* *Score on MCAG assessment task 3 (MCAG-3)*
Treatment Variables	*	*Content instruction (**CI**)*
	**	*Metacognitive awareness guidance (**MCAG**)*
Dependent Variables		*Score on assessment task 1 – "How Paper is Made"* *Score on assessment task 2 – "The End"* *Score on assessment task 3 - "We Dream"* *Total score on assessment tasks* *Score on mental effort (**ME**)*
	*	*Score on importance & effectiveness (IE CI)*
	**	*Score on importance & effectiveness (IE MCAG)*
		*Score on Metacognitive Strategy Index (**MSIQ**)*
	***	*Score on MSI - B (before reading)*
	***	*Score on MSI - D (during reading)*
	***	*Score on MSI - A (after reading)*
	**	*Teacher interviews*

* Only for Placebo Group 2
** Only for Experimental Group 3
*** MSI-B, MSI-D and MSI-A are three parts of the MSI Questionnaire (MSIQ)

Following is a description of the measured variables of the research and the instruments used to measure and validate them. The descriptions will relate to the three clusters of measured research variables - control variables, treatment variables and dependent variables.

Measured control variables and instruments:

- *Standard reading comprehension test*
- *Grade in reading and writing (school files)*
- *Gender*

- Score on MCAG assessment task 1 (MCAG-1)
- Score on MCAG assessment task 2 (MCAG-2)
- Score on MCAG assessment task 3 (MCAG-3)

Standard reading comprehension test - Two weeks before starting the research procedure, all research subjects (N=300) were given a standard reading comprehension test for the 4th grade developed by the Israeli Ministry of Education (Lewy & Raz 1980). The test consisted of three texts (Appendix A - Stories A, B and C), ranging in length from 120 to 160 words, followed by five multiple-choice questions on each (a total of 15 items). Pupils were asked to read the passages and answer the questions by circling one of four possible answers.

The reading comprehension scores were used to determine if there were statistically significant differences in reading comprehension performance among subjects in treatment group 3, placebo group 2, and control group 1, prior to the intervention. One-way analysis of variance (ANOVA) was performed on the pre-test measures (control variables) and yielded no significant differences among groups ($F_{2,297}=1.88$, $p = 0.189$ – Table 8).

Grades in reading and writing (school files) - For each of the 300 research subjects, grades on reading and writing were obtained from school files. The mean scores for the three control variables - standard reading comprehension test scores, reading grade and writing grade - was each pupil's personal reading ability score. The reading ability score was used as a covariant in the analysis.

Gender - Data was collected to identify possible gender-related tendencies, if any.

MCAG - Pilot Study 2: This pilot study had two purposes. The first was to test the clarity and readability of the MCAG for 4th grade pupils. The second and more essential purpose was to determine scoring guidelines for the three written MCAGs using samples of pupils' answers.

Twenty-four 4th grade pupils from an elementary school not participating in the study were asked to answer one of the three written MCAGs (see Appendices J, K, L), after having been randomly divided into three groups. Eight pupils answered each of the three MCAGs. The twenty four answer sheets served as the basis for a discussion at a meeting of the SCRIPT[7] committee, intended to draw up guidelines for an answer key.

The committee members were first given the MCAG questionnaires, as presented in Appendices J, K, L, and were asked the following questions:

- Could the questions be misunderstood by 4th grade pupils? Does the MCAG contain any difficult or unclear phraseology?
- Would a more personalised wording of the question produce better results?
- Can the question be better asked in a more direct or a more indirect form?
- Is the form of response easy, defined, uniform and adequate for the purpose?

The committee members' responses to these questions (e.g., "very clear", "well phrased", "comply with the definitions", "adequate for the purpose") in addition to the reactions of the 24 pupils on whom the material was piloted (e.g., "can we get one more", "not as boring as usual") resulted in the decision not to revise the written MCAGs.

The committee was next asked to consider the pupils' answers to the MCAG questions and to suggest guidelines and recommendations for a scoring key. The following recommendations were made:

1. The key must be sensitive to the diversity of answers which may be given.
2. The methods and formats for ranking the answers to the three assessment tasks (Appendix P, Q and R) can be adopted.
3. The score for the MCAG has to be a general one, that is to say, one which does not distinguish between the elements of metacognitive awareness: Building,

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[7] 'Special Committee for Research in Process of Texts' (SCRIPT), a professional group of experts in literacy and text processing, sponsored by the Israeli Ministry of Education and Ben-Gurion University.

Creating, Developing (BCD) relevant schema, activating prior knowledge, using content information.

4. The specifications for determining the scores should be developed from the diversity of answers vis-a-vis the theoretical framework.
5. Specifications should be developed taking into account the level of closeness, coherence, compatibility and consistency between pupils' prior knowledge as presented in their answers and the relevant prior knowledge required for the subject.

The above recommendations were taken into consideration as a basis for generating a scoring guide for the metacognitive awareness guidance questions (Appendix S). As a result, an answer key for each of the three MCAGs was developed (answer keys 1, 2 and 3: Appendices T, U and V).

In addition, it was agreed that all the questions on the MCAG initially be assigned a high cognitive level (3) and a high level of difficulty (3). The basic reason for this is that all MCAG items require a high level of elaboration. Pupils were asked to write their own text through activating prior knowledge, to make predictions, raise questions and thoughts, give opinions, suggest possible answers, construct their own responses, all without relating to a specific text. Furthermore, they were asked to demonstrate their ability to utilise their prior knowledge to support their conclusions.

Measured Dependent Variables and Instruments

Score on assessment task 1 – "How Paper is Made"
Score on assessment task 2 – "The End"
Score on assessment task 3 - "We Dream"
Total score on assessment tasks
*Score on mental effort (**ME**)*
* *Score on importance & effectiveness (IE CI)*
** *Score on importance & effectiveness (IE MCAG)*
*Score on Metacognitive Strategy Index (**MSIQ**)*
*** *Score on MSI - B (before reading)*
*** *Score on MSI - D (during reading)*
*** *Score on MSI - A (after reading)*
** *Teacher interviews*

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* Only for Placebo Group 2
** Only for Experimental Group 3
*** MSI-B, MSI-D and MSI-A are three parts of the MSI Questionnaire (MSIQ)

The three reading assessment tasks - The three reading assessment tasks were taken from the "Kits of Assessment Tasks" (KATs) in Reading. The KATs are discussed in detail in the beginning of Chapter 2. The following three reading assessment tasks are the basis for all three versions of the research tool:

- Assessment Task 1 - "How Paper is Made" (Appendix B)
- Assessment Task 2 - "The End" (Appendix C)
- Assessment Task 3 - "We Dream" (Appendix D)

Selection of the above three assessment tasks from the KATs collection was based on the following:

- Availability at the beginning of the research.
- Adequacy in terms of age level, 4th grade curriculum and fields of interest.
- Recommendations by the development team members who represent a variety of areas of expertise: linguistics, reading-writing, teaching, evaluation and curriculum.
- Compliance with the principles of KATs as defined by the developers. The three tasks are "authentic", "challenging" and "attainable".
- Represent the major genres of reading in the KATs:
  - ◊ "How Paper is Made" - an informative text which deals with a topic of social value, the environment (the problem of conservation of natural resources);
  - ◊ "The End" - two different translations of children's poem by A. A. Milne;
  - ◊ "We Dream" - an expository text in the style of science for children.

Every assessment task consists of a reading text followed by questions. Each item in the reading assessment task was classified by the developers of the KATs according to two parameters: cognitive level and level of difficulty, on a scale of 1 to 3 (Appendices P, Q, R), as shown in Table 3:

Table 3: Assessment Task Items by Cognitive and Difficulty Level

Assessment Task	**Cognitive Level**			Total	**Level of Difficulty**			Total
	1	**2**	**3**	Items	**1**	**2**	**3**	Items
How Paper is Made	6	1	10	17	6	8	3	17
The End	-	3	7	10	-	3	7	10
We Dream	5	-	2	7	3	-	4	7
Total	11	4	19	34	9	11	14	34

As we can see from Table 3, the items in the three assessment tasks do not necessarily have the same ranking on the two parameters - cognitive level and level of difficulty.

For example, in Assessment Task 3, question 1 is "*How do we know when someone is dreaming?*". On the cognitive level, this item is classified as 1 (basic - demands identifying details) while its level of difficulty is defined as 3 (there is some difficulty in identifying details because of the complexity of the text). Another example is question 1 in Assessment Task 1: "*Do you know what paper is made of, and how it is made?*". This item is defined as 1 (basic item) for cognitive level and as 3 (difficult item) for level of difficulty. The developers of the KATs offer the following explanation: "In piloting, we discovered that the item was difficult, since many children do not have this knowledge" (Appendix P).

Assessment tasks - answer keys - For each assessment task, the developers defined an answer key that gave specific guidelines to calculate the scores (Appendices P, Q, R). The key relates to various factors including text selection, score for each item (0-3) and sample answers. Items are generally graded on a scale of 1 to 3. When a yes/no answer is called for, the mark is either 0 or 3 (0=wrong, 3=correct). For open items, there are criteria for each score. As a rule, there is no need to give an overall mark to the entire paper. It is enough to note each item separately in order to construct a "profile" of pupil performance on various types of items. The scoring guide for assessment is differential. For instance, an item, which tests the ability to make generalisations will be assessed and given a grade only for generalisation, and scoring will not relate to the written manner of expression, such as problems of phrasing or spelling. Open items allow for assessment in accordance with the type of expression. For instance, in assessing a story, different considerations are employed than for assessing criticism or drawing conclusions. The authors recommend giving separate grades for handwriting, spelling, punctuation, and presentations of ideas. Grading will therefore be performed along several dimensions and each item will be given a separate mark, as opposed to the traditional overall mark (Inbar 1995).

Answer keys for Assessment tasks 1, 2 and 3 are presented in Appendices P, Q and R, respectively. Analysis of the results will consider the items from three points of view: each assessment task and its questions (Assessment Task 1 - 17 items; Assessment Task 2 - 10 items; Assessment Task 3 - 7 items), all items together (34 items), and according to cognitive level (1-3) and level of difficulty (1-3) (see Table 3).

Self-report of mental effort expenditure - After processing the first assessment task, all the research subjects were given a brief questionnaire consisting of an introduction and five questions (ME - Appendix E). The questionnaire first introduced the idea of expenditure of mental effort and illustrated this idea using two examples: tying one's shoes and struggling through a math problem. The former received a low score (1) and the latter a high score (5) on a mental effort expenditure scale. Following the examples, the subjects were asked to indicate how much mental effort they invested while processing the assessment task they had just performed on a 5-point Likert scale with responses ranging from "I didn't put any thought into it" (1) to "I put an awful lot of thought into it" (5). Subjects were asked to report on the level of expenditure of mental effort by answering three direct questions:

1. *"Where on this scale would you put the amount of thought you put into the reading activities you did today?"*
2. *"To what extent did you think about what you were doing during the reading activity you did today?"*
3. *"To what extent did you concentrate while you were doing the reading activity today?"*

Following the above were two questions about other factors that relate to and influence the level of mental effort expenditure - interest and innovation:

4. *"To what extent was the reading activity you did today interesting?"*
5. *"To what extent was the reading activity you did today different from other reading activities you have done in school?"*

The questionnaire was a modification of a similar measure successfully used in the previous studies (Salomon 1984; Salomon & Leigh 1984; Guterman 1987). In these studies, it was found that self-reporting on effort expended in an activity just completed correlated as high as 0.45 with inference generation after initial ability was partialed out. It was also noted that children on the average are quite capable of assessing the effort they expend in particular task. The amount of mental effort investment reported correlates up to 0.67 with the number of generated inferences (Salomon 1983: 44). Children asked to read a difficult text report on the expenditure of more effort than those asked to read an easy text (Leigh, reported in Roberts & Salomon 1982: 3). Children asked to read for fun report investing less effort and generate fewer inferences than children who are asked to read for an exam (Halpern, in

Roberts & Salomon 1982: 4), and students who are told that a TV show was designed for a public network report expending more amount of mental effort in processing it than those told it was designed for a commercial network (Kunkle, reported in Salomon 1983: 47). It was also reported that this is a relatively satisfactory way of measuring the amount of invested mental effort under natural conditions of exposure to material, independent of the measurement of performance or learning from which such effort is usually inferred (Salomon 1983: 46).

The reliability of the five items of the Mental Effort (ME - Appendix E) measurement used in this research was found to be 0.74. This is similar to the 0.77 reliability level found in an earlier study (Salomon et al. 1989).

The decision to consider the mental effort expenditure of research subjects as one of the research variables is drawn from the argument that learning is strongly influenced by the amount of mental effort that learners invest in processing learning materials (Salomon 1981, 1983). Mental effort invested in processing means the employment of non-automatic elaborations performed on the material, in Salomon's words: "cognitive capacity usage", "depth, mindful and thoughtful process" (Salomon 1984: 654). Kintsch (1977) postulated that the more a person mentally elaborated material, the more contact it made with other mental schemata, thus leaving more memory traces and enriching the meanings arrived at (1977: 106). Recall, comprehension, skill mastery, and even transfer to new material improve when more elaboration is involved (e.g., Mayer 1980: 780). The idea of mental effort expanded in the learning process is based on two distinctions, relevant to the theoretical framework of this research.

The first is a distinction between two kinds of mental elaboration of learning material - *automatic* and *non-automatic*. *Automatic* elaboration is carried out by two well-mastered mental processes over which a person exercises little conscious control, and which are carried out with great ease in large chunks. Such elaborations would usually be the result of much repeated practice and training (Langer & Inbar 1979; Langer 1985).

Elaborations that are *controlled* and *non-automatic* require attention and effort (Shiffrin & Schneider 1977). Such elaborations would generally be applied to

relatively new, complex, or otherwise less-practised material and improve learning in the sense of better integration of the material in the memory.

The second distinction is that developed by Langer (1985) between the constructs of *mindlessness* and *mindfulness*.

Mindlessness is defined by Langer as "the absence of active conscious information processing, where the individual relies on the structure of the situation representative of its underlying meaning" (1985: 251).

Mindfulness, in contrast, is a

> *cognitively active state characterized by conscious manipulation of the elements of one's environment, in which case the individual questions all categories or constructs new ones.... Although attention is a necessary condition for mindfulness, it is not sufficient. That is, mindfulness involves the active manipulation of the elements that one attends* (Langer & Inbar 1980: 360).

For Langer, *mindlessness* in processing means ignoring information which is perceived to be already known, and can be easily assimilated (rightly or wrongly) into pre-existing schemata. Mindful behaviour means taking full account of such information.

There are clear and strong connections between the mental effort expanded in learning material, and the role of metacognitive awareness while processing learning material. Since metacognitive awareness is an essential building block of the theoretical framework of this research, I decided to use it as research process variable.

Several researchers utilised the idea of effort as a hypothetical construct to explain the level of performance. For example, Bandura (1982) related to the construct of sustained effort and performance: the more one believes in one's ability to perform a task, the more one is likely to invest sustained effort in performing it (198). Burkowsky and Willows (1980) used a similar construct to explain the reading failures of learners who display helplessness. The more they fail, the more helpless they feel, and the less effort they invest in reading.

Importance and Effectiveness questionnaire - In addition to the mental effort expenditure report, subjects from the Content Instruction group (group 2 - CIG) and from the treatment group (group 3 - MCAG) were asked to report on the importance and effectiveness of the two different versions of the intervention they experienced

(Content Instruction and Metacognitive Awareness Guidance, respectively). It has long been assumed that students "work harder" (invest more mental effort) and "learn more" (exhibit a higher level of achievement) on tasks that they find more important and on tasks related to their interests, than on other tasks. Recent research has confirmed this relationship and suggested that interest may have an energising effect on learning and can lead students to use deep comprehension processes (Renninger, Hidi & Krapp 1992; Tobias 1994). The decision to consider subjects' self reports on interest, importance and effectiveness (IE - Appendices F and G - part 2) as one of the research variables is drawn from the arguments cited above and from the strong connection between this variable and the conceptual framework of this research.

The report included six questions given to pupils as *Part 2* of their Mental Effort questionnaire (Appendices F and G - part 2). The first section of the report defined the activity that pupils were asked to relate to when answering the six questions.

For the placebo group (CIG), this section read:

> *The reading activity you did in class today had two parts:*
> *Part 1 - you read a passage and tried to understand it;*
> *Part 2 - you answered questions about the passage.*
> *All the questions below are about Part 1 - reading the passage and trying to understand it.*
> *Circle your answer*

For the treatment group (MCAG) the first section was the following:

> *The reading activity you did in class today had two parts:*
> *Part 1 - you answered questions before you read the passage*
> *Part 2 - you read the passage and then answered questions.*
> *All the questions below are about Part 1: questions you answered before you read the passage.*
> *Circle your answer*

Two kinds of questions followed this introduction: multiple choice questions (items 6, 7 and 10) and yes/no questions (items 8, 9 and 11). The yes/no questions were followed by open-ended items explaining the answer chosen. The reliability of the 6 items of the IE measurement used in this research was found to be 0.75.

Metacognitive Strategy Index questionnaire (MSIQ) - The MSIQ (Appendix I) was administered 14 days after the three assessment tasks were performed and was given to all three groups. It was based on a questionnaire designed by Schmitt (1990) to measure children's awareness of metacognitive reading strategy (Appendix H - MSI). In her words:

> *Because it has been shown that awareness of meta-comprehension strategies is characteristic of good comprehenders (e.g., Paris & Jacobs, 1984; Schmitt, 1988), it would be useful for teachers to evaluate their students' awareness of those strategies. Such knowledge could be used informally to design a reading program that includes explicit instruction in meta-comprehension skills (e.g., Paris et al., 1984) or is structured so that it fosters the development of such skills (e.g., Duffy et al., 1987; Schmitt, 1988; Schmitt & Baumann, 1986)*... (Schmitt 1990: 454).

The questionnaire was originally developed to measure the strategic awareness of students who participated in a meta-comprehension training study (Schmitt 1988) and adaptations of the index have been used in several additional studies (e.g., Baumann & Schmitt 1987; Lonberger 1988).

The MSI is a 25 item, 4-option, multiple-choice questionnaire that asks students about strategies they could use before, during, and after reading texts and stories. The strategies assessed by the MSI are consistent with those taught in several meta-comprehension instructional studies (e.g., Braun, Rennie & Labercane 1986; Palincsar & Brown 1984; Risko & Feldman 1986). Students were asked to read a list of four statements and decide which would help them the most to understand the story. The instructions clarify that "there are no right answers. It is just what you think would help the most, circle the number of the statement you choose" (Appendix H - directions).

The 25 questions had four statements each, a total of 100 statements, and related to three time periods:

- Before reading the story - Appendix H questions 1-7
- During reading the story - Appendix H questions 8-13
- After reading the story - Appendix H questions 14-25

Schmitt classified the 25 questions according to six metacognitive awareness strategies. Table 4, adapted from Schmitt (1990: 455), defines each category and suggests the questions which it represents.

Table 4: Strategies measured by the Metacognitive Strategy Index

Predicting and Verifying

Predicting the content of a story promotes active comprehension by giving readers a purpose for reading (i.e., to verify predictions). Evaluating predictions and generating new ones as necessary enhances the constructive nature of the reading process.

Questions 1, 4, 13, 15, 16, 18, 23

Previewing

Previewing the text facilitates comprehension by activating background knowledge and providing information for making predictions.

Questions 2, 3

Purpose-setting

Reading with a purpose promotes active, strategic reading.

Questions 5, 7, 21

Self-Questioning

Generating questions to be answered promotes active comprehension by giving readers a purpose for reading (i.e., answer the questions).

Questions 6, 14, 17

Drawing on background knowledge

Activating and incorporating information from background knowledge contributes to comprehension by helping readers make inferences and generate predictions.

Questions 8, 9, 10, 19, 24, 25

Summarising and applying fix-up strategies

Summarising the content at various points in the story serves as a form of comprehension monitoring. Rereading or suspending judgement and reading on when comprehension breaks down represents strategic reading.

Questions 11, 12, 20, 22

The 'correct' response for each item that is indicative of a meta-comprehension awareness strategy appears in bold face in Appendix H.

The MSI has been shown to be a reliable measure of meta-comprehension strategy awareness. Lonberger (1988) reported an MSI internal consistency value of 0.87 using the Kuder-Richardson Formula 20 (6). To increase the overall reliability of the MSI, it was designed so that several questions address each strategy cluster.

Validity data for the MSI come from several sources. Schmitt (1988) compared it with the Index of Reading Awareness (IRA), a self report measure of awareness of the need

to evaluate, plan, and regulate reading processes (Paris & Jacobs 1984; Schmitt & Baumann 1986). A statistically significant correlation was found between the MSI and the IRA ($r = 0.48$, $p<0.001$), suggesting that both instruments measure similar constructs. In addition, Schmitt (1988) found in an experimental study that students who received training in meta-comprehension strategies scored significantly higher on the MSI than students in a non-instructed group (1988: 455). She also found statistically significant correlation between the MSI and two comprehension measures, an error detection task ($r = 0.50$, $p < 0.001$) and a cloze task ($r = 0.49$, $p < 0.001$) (1988: 455). These data provide further evidence of the relationship between performance on the MSI and tasks commonly used to measure students' meta-comprehension ability.

MSI - Pilot Study 1 - Since the MSI questionnaire was originally written in English, the first step was translating it into Hebrew. This was done by English as a Second Language (ESL) teachers of 4th grade pupils. The process of modifying the MSI questionnaire for Israeli 4th grade pupils was conducted on three levels: 4th grade pupils, 4th grade teachers and reading experts.

Five 4th grade pupils and three 4th grade teachers who did not participate in the study were asked to answer the translated MSI questionnaire. Two of the pupils failed to complete the questionnaire within the 45-minute time frame. All five pupils asked to abort the mission before completing the questionnaire. Afterwards, each, individually, gave his or her opinion about it. Both pupils and teachers complained about the length of the questionnaire ("too long", "tedious", "tiring"). Another complaint was about repetition - they felt that the same questions were asked more than once. Two pupils said that they felt that the questionnaires aimed to trick them, so that every time they felt that a question had already been asked, they looked back to check their previous answer. Three of the pupils and two teachers said that some questions had more than one right answer. The teachers suggested that there should be more distinction between the three parts of the questionnaire (before reading, during reading and after reading) and the fact that all answers may be right but only the answer that suits you should be selected needed greater emphasis. The teachers' and pupils' opinions, reflection and responses were collected and the questionnaires (in Hebrew and English) were brought

to a meeting of SCRIPT (Special Committee for Research in Process of Text) in order to draw up recommendations for modifying the questionnaire. Following are the SCRIPT members' main recommendations:

- make the questionnaire more friendly;
- add an introduction page to explain the three parts of the questionnaire;
- shorten the questionnaire (which resulted in cutting out eight key questions - "it is important that the pupils be mindful, conscious, and effective");
- emphasise the fact that there is no 'right answer' and that pupils have to choose the one that will help them most;
- change the expression "it is good idea to" as it appeared in the original text to "it is worthwhile" which in Hebrew implies personal benefit.

All the above recommendations were accepted, adopted and implemented in the Hebrew version of the MSI questionnaire (MSIQ - Appendix I). The Hebrew version consists of 17 questions divided into three parts as follows:

- Part 1 - Before reading: Appendix I - questions 1-7
- Part 2 - During reading: Appendix I - questions 8-13
- Part 3 - After reading: Appendix I - questions 14-17

The six categories are represented in this version as follows:

- *Predicting and verifying* - Questions 1, 3, 11, 12
- *Previewing* - Question 2
- *Purpose setting* - Questions 4, 6, 14
- *Self-questioning* - Questions 5, 10
- *Drawing from background knowledge* - Questions 7, 13, 16, 17
- *Summarising and applying fix-up strategies* - Questions 8, 9, 15

Though activation of prior knowledge is included in all the above categories, I defined a more generalised category for the research - BCD: building, creating and discovering relevant prior knowledge. This is represented by questions 3, 5, 6, 7, 13, 16 and 17.

The data obtained from the MSIQ was analysed on four levels. The first is the overall level of metacognitive awareness. The second is the level of metacognitive awareness for each of the three parts - before, during and after reading. The third is associated with the level of metacognitive awareness of each of the six categories. The last is the

level of metacognitive awareness in the BCD category. The reliability of the 17 items of the MSIQ (Appendix I) measurement used in this research was found to be 0.68.

Teacher Interviews - The purpose of interviewing teachers of the treatment group (group 3 - MCAG) was to gain their perspective, thoughts and the lessons learned from their participation in the research. Specifically, I wanted to find out their thoughts concerning their expectations from such a learning intervention and its perceived influence on their pupils' performance on reading assessment tasks. To obtain qualitative results from the interviews, I used the "general interviewing guide approach" (Fontana & Frey 1994) in which I provided the teachers with guidelines and a framework within which they could express their understanding in their own words (see Appendix W - Guidelines for Teacher Interviews, and Appendices X1, X2, X3, X4, for teachers' responses).

Treatments and Materials

Metacognitive Awareness Guidance (MCAG - 1,2,3) and *Content Instruction* (CI - 1,2,3)

Three different versions of processing the assessment tasks were designed, and served as the basis for the three treatments. The three versions include the same three assessment tasks, are to be carried out during three reading assessment classroom sessions, and will be discussed after the description of the three versions.

The **first version** was designed for group 1 (control group). The pupils (CG-1, N=102) were asked to read the text and answer the questions that followed. This is the procedure set forth by the developers of the KATs (Ministry of Education 1996).

The **second version** was especially designed to reduce a possible halo effect, i.e., performance affected by being part of a special procedure. A placebo procedure was designed for group 2 (placebo group). Pupils in this group (CI Group, N=85) were asked to read the Content Instructions and the text only, and when they finished reading, to raise their hands to signal that they were ready to proceed to the reading assessment tasks. The Content Instruction consisted of instructions that focused on content and procedure, i.e.. *Read the passage ... carefully. When you finish reading it, you will be asked questions on what you read. Pay attention. Before you begin to answer the question, be sure that you understand the passage.... After you answer all the questions, go back and check your answers* (see Appendix M for Content Instruction for assessment task 1, Appendix N for assessment task 2, and Appendix O for assessment task 3). The main purpose for this CI placebo group was to minimise the effect of special attention given to the MCA treatment group - the idea of receiving special attention, of being singled out to participate in a study, was enough motivation to improve performance, what Gall et al. (1996) refer to as the "Hawthorne effect". By minimising the "Hawthorne effect", the placebo group strengthened the external validity of the research.

The **third version**, the fully developed target tool - the Metacognitive Awareness Guidance - was given to treatment group 3. It included metacognitive awareness guidance for each of the three reading assessment tasks. The MCAG was given to pupils in the metacognitive group (MCA group, N=113) before performing the

assessment tasks. After answering the metacognitive awareness questions, they were asked to say out loud, "*Now I know a lot about.... What I know about ... will help me to understand the passage. Now it will be easier for me to study the passage*", and only then to signal that they were ready to process the assessment task. The written Metacognitive Awareness Guidance is presented in Appendix J - MCAG-1 for assessment task 1, Appendix K - MCAG-2 for assessment task 2, and Appendix L - MCAG-3 for assessment task 3.

The Metacognitive Awareness Guidance (MCAG) has four main aims, based on four major metacognitive awareness principles. The *first* is to generate readiness, arouse interest and create expectations. In this research, these are accomplished using such metacognitive awareness methods as providing context information, offering relevant background knowledge and creating advance organisers. The *second* aim is to Build, Create, Discover (BCD) the relevant schema. These are achieved by raising problems and suggesting possible answers, by guiding learners to use context information, by asking them to make predictions and judgements and by directing them to focus on what they already know about a topic. The *third* aim is to activate relevant prior knowledge by asking learners to write their own thoughts and knowledge about the subject, by using the Cloze method to extend their thinking about the subject and by encouraging the learners to become involved with active writing. The *fourth* aim is to raise the learners' metacognitive awareness (MCA) of the effect of utilising their existing prior knowledge on the performance and outcome of an assessment task, and by diverting their tendency to respond impulsively by strongly encouraging them to stop and think before processing an assessment task, and by encouraging them to use direct explicit self-talk.

The theoretical basis, principles and methods of implementation of the MCAG were described, discussed and analysed in Chapter 2 - The Empirical Framework. The specific principles and methods of the metacognitive awareness guidance (MCAG) are summarised in Tables 5a, 5b, and 5c, below.

Table 5a: Summary of questions, principles and methods in the written Metacognitive Awareness Guidance - Reading Assessment 1

Specific Metacognitive Awareness Question	Metacognitive Awareness Principles	Metacognitive Awareness Process - Methods
"The title of the passage you are about to read is.... The writer describes the following...."	Generating readiness Arousing interest Creating expectations	Giving context information Providing background knowledge statements
"What do you think...?" "What problem could be...?" "What solution can you...?" "In your opinion, what...?"	Building, Creating, Discovering (BCD) the relevant schemata	Using language of thinking Using (open-ended) questions that assist performance Focusing on existing knowledge Raising problems and suggesting possible answers
"Write a short paragraph ... to fit the title ... using the following words..."	Activating relevant prior knowledge	Writing their own thoughts and knowledge Extending thinking about the subject Active writing - actively using words of the semantic field
"Please say these words aloud: 'Now I know more about .... This knowledge will help me to understand / to study the passage"	Rising MCA to the effect of using prior knowledge on the performance and outcome. Preventing learners from responding impulsively	Direct explicit self-talk Making observations Reflecting on their own prior knowledge Stop and think

Table 5b: Summary of questions, principles and methods in the written Metacognitive Awareness Guidance - Reading Assessment 2

Specific Metacognitive Awareness Question	Metacognitive Awareness Principles	Metacognitive Awareness Process - Methods
"You are about to read two different.... ... was written in ... by ... who is.... He was born .... He wrote and translated.... His style of writing..."	Generating readiness Arousing interest Creating expectations	Creating advanced organiser Providing background knowledge statement Building context to raise interest and expectations
"In your opinion, will there be...? What difference...? Why...?"	Building, Creating, Discovering (BCD) the relevant schemata	Raising learner's awareness of the influence of context information Guiding learners to use context information
"Complete the missing words ... and repeat to yourself..."	Activating relevant prior knowledge	Using Cloze method
"Please say these words aloud: 'Now I know more about .... This knowledge will help me to understand / to study the passage"	Raising MCA to the effect of using prior knowledge on the performance and outcome. Preventing learners from responding impulsively	Direct explicit self-talk Making observations Reflecting on their own prior knowledge Stop and think

Table 5c: Summary of questions, principles and methods in the written Metacognitive Awareness Guidance - Reading Assessment 3

Specific Metacognitive Awareness Question	Metacognitive Awareness Principles	Metacognitive Awareness Process - Methods
"The reading passage that you are about to read is from ... and it is called...."	Generating readiness Arousing interest Creating expectations	Creating advanced organiser Providing background knowledge statement Building context to raise interest and expectations
"Write questions that you think will be answered.... Write a possible answer.... In my opinion...."	Building, Creating, Discovering (BCD) the relevant schemata	Make predictions Make judgements Construct meaning by focusing on what they already know about... Ask questions and suggest answers
"...Yes or No questions ... because...."	Activating relevant prior knowledge	Explain and substantiate your thinking Use prior knowledge Make judgements
"Please say these words aloud: Now I know more about.... Everything I already know will help me understand / answer the question / study...."	Raising MCA to the effect of using prior knowledge on the performance and outcome. Preventing learners from responding impulsively	Direct explicit self-talk Making observations Reflecting on their own prior knowledge Stop and think

The Research Procedure

This section describes the procedure used in the research. A summary of the procedure can be found in Table 6, below. Before beginning the research, approval to use materials from the KATs collection, then in the initial implementation stage, and to conduct research in elementary school classes, was requested and granted by the Israeli Ministry of Education.

Stage 1: Preparation

This stage is composed of ***two pilot studies and a preparation meeting*** with 4th grade teachers who participated in the research. The aim of the first pilot study was to modify the MSI questionnaire to suit the current research. The second pilot study had two purposes. The first was to test the clarity and readability of the MCAG for 4th grade pupils, and the second, more essential, purpose was to determine guidelines for the three written MCAGs developed for this research. A complete description of the two pilot studies was given in the previous section, **Measured Variables and Instruments.**

Teacher preparation meeting - Preparation meetings emphasised the essential guidelines of the research procedure, and the teachers' role in the procedure. I described the three versions of the experimental tool and the roles of the three research groups. Together, we randomly assigned classes to the research groups. The teachers were given the following guidelines:

- It is extremely important that the experiment be conducted in language arts lessons, integrated into daily class activities. The class teacher, therefore, will conduct the experiment without the presence of the researcher.
- Pupils should be informed that the goal of the experiment is to check if the learning activities are appropriate for the 4th grade, and not intended to evaluate learner performance.
- As a part of the procedure, the teachers will read the instructions of every questionnaire aloud.
- Teachers of the treatment group (group 3) were asked to encourage pupils strongly to read the "self-talk", and to say it aloud to themselves before continuing to the assessment tasks.
- Teachers were asked to try and conduct the three reading assessment sessions within a two week period.

At the preparatory meeting, each teacher received the Standard Reading Comprehension Test materials (Appendix A), and we agreed to meet again after they administered the tests (two weeks later).

Stage 2: Pre-test

All subjects were pre-tested in their classrooms using a standard test of reading comprehension (see 'Measurements and Instruments' below). The test took place 2 weeks before the onset of the study. I then held meetings with the teachers on a one-to-one basis. I collected the processed reading comprehension test materials, and gave each teacher the specific materials for his or her class, in the order in which they were to be processed (Assessment Task 1, ME Questionnaire, IE Questionnaire, Assessment Task 2, Assessment Task 3, MSI questionnaire, and, depending on the research group, MCAG or CI). At the same time, language (reading & writing) grades were obtained from school records.

Stage 3: Experiment

Before the beginning of the three reading assessment sessions, all 300 participating pupils were informed by their teachers that in the next two weeks they would be involved in a research project whose goal was to determine whether the learning materials that they were going to receive were adequate for use in the forth grade class. They were assured that the research would have no impact on their grades. The three reading assessment sessions were conducted by the language arts teacher in each classroom. At each session, the subjects were asked to process one of the three experimental versions of the assessment task, in accordance with their group. No time limitation was dictated; the assessment sessions were originally planned for two 45-minute lessons, much more than required for carrying out the task.

Immediately after processing the first assessment task, all subjects were asked to report on the level of mental effort expenditure required by the activity they had just performed (see Appendix E).

Subjects that received Content Instruction treatment (placebo group 2 - CI) and of the Meta-Cognitive Awareness treatment (treatment group 3 - MCAG) were, in addition, asked to report on the importance and effectiveness of the learning activity they

performed before processing the assessment task - Content Instruction or Metacognitive Awareness Guidance (Appendices F, G - part 2).

Stage 4: Post-test

Fourteen days after completing the three sessions, subjects received the Meta Cognitive Awareness Strategy Index questionnaire (see 'Measured Variables and Instruments' and Appendix I). Approximately one month later, each of the 4 teachers whose classes participated as the MCA treatment group (treatment group 3 - MCAG) was interviewed (see Appendices X1, X2, X3 and X4).

The process described above is summarised in Table 6.

Table 6: The Research Procedure

Stage	Activity	Description
Stage 1 - Preparation	Pilot Study 2	Scoring guidance and key for Metacognitive Awareness Guidance
	Pilot Study 1	MSI Questionnaire modification
		Preparation meeting with all 4th grade teachers
Stage 2 - Pre-test		Reading Comprehension test
		Reading and writing scores (school files)
Stage 3 - Experiment		Briefing of research subjects (pupils)
	Assessment Session 1 (Assessment Task 1)	Group 1 - Version 1; Group 2 - Version 2; Group 3 - Version 3
		Mental Effort Questionnaire to all subjects
		Importance & Effectiveness - subjects of groups 2 and 3
	Assessment Session 2 (Assessment Task 2)	Group 1 - Version 1; Group 2 - Version 2; Group 3 - Version 3
	Assessment Session 3 (Assessment Task 3)	Group 1 - Version 1; Group 2 - Version 2; Group 3 - Version 3
Stage 4 - Post-test	After 2 weeks	Meta Cognitive Awareness Strategy Questionnaire to all subjects
	After 4 weeks	Interviews with teachers of Group 3

Data Collection and Analysis

Table 7 describes the data collection: Research variables vis-a-vis Research groups.

Table 7: Data Collection

Variables \ Groups	Group 1 Control Group	Group 2 - CI Content Instruction Placebo Group	Group 3 - MCA Treatment Group
Gender	+	+	+
Reading Test Score	+	+	+
Reading - Teachers' Grade	+	+	+
Writing - Teachers' Grade	+	+	+
Assessment Task 1 - Score	+	+	+
Assessment Task 2 - Score	+	+	+
Assessment Task 3 - Score	+	+	+
Assessment Tasks - Total Score	+	+	+
MCAG-1 - Score	-	-	+
MCAG-2 - Score	-	-	+
MCAG-3 - Score	-	-	+
ME Score	+	+	+
IE Score	-	+	+
MSIQ - Total Score	+	+	+
MSI - B - Score	+	+	+
MSI - D - Score	+	+	+
MSI - A - Score	+	+	+
Teacher Interviews	-	-	+

The instruments used for data collection in this research were:

- ***Tests*** - Standard reading comprehension tests (Appendix A)
- ***Assessment Tasks*** - Three assessment tasks (Appendices B, C, D)
- ***School Records*** - Pupils' grades in reading and writing
- ***Learning Materials*** - Metacognitive Awareness Guidance (Appendices J, K, L)
- ***Questionnaires*** -
  - ◊ Mental Effort questionnaire (Appendix E)
  - ◊ Importance and Effectiveness questionnaire (Appendices F, G)
  - ◊ Metacognitive Awareness Strategy Index questionnaire (Appendix I)
- ***Interviews*** - Interviews of treatment group teachers (Appendices X1, X2, X3, X4)

The first step in analysing the data was computing descriptive statistics for each of the research groups. These statistics include scores on single variables to measure central tendency (means, median and mode), and to measure variability (frequency, percentage, standard deviation, variance and range).

The next step was performing tests of statistical significance, in accordance with the outcome of the first step, and with the research hypotheses.

The major tests of statistical significance used in this research are the following:

T test	Estimates the probability that the difference between two groups is likely to be the result of chance variation in scores.
ANOVA	Estimates the probability that differences among two or more groups is likely to be the result of chance variations in scores.
ANCOVA	The analysis of covariance is similar to the ANOVA except that it allows to control for the influence of independent variables (presented as control variables in this study) that may vary between the groups before the treatment is introduces.
Chi Square	Used with nominal level data to test the statistical independence of two variables.
Pearson Product-Moment Coefficient test	Used to determine direction and magnitude of relationship between two measured variables, a test of statistical significance applied to a correlation coefficient.

Seven hypotheses were tested in this research, organised into three main clusters. The first cluster of the hypotheses deals with the comparison of the three groups of students

participating in the study. The second cluster of the hypotheses focuses on the MCA experimental group only. It examines to what extent the pupils' scores on the three MCA questionnaires affect the score of sub-groups of the MCA experimental group. I refer to this cluster of hypotheses as "differences among sub-groups of the MCA experimental group" despite the fact that the statistical techniques employed (correlation and regression coefficients) do not result in a logical division into sub-groups.

The third cluster refers to additional analyses and interviews with the teachers of MCA treatment group 3.

The Sidak t-test for multiple comparisons between research groups was used to determine which of the mean scores differed significantly from the others, and therefore, where the significant effects are. The Sidak t-test was preferred to the more traditionally-used Scheffe test mainly because its pair-wise comparisons are generally more powerful.

Gall et al. (1996) define four factors to be taken into consideration to obtain statistical significance - to maximise the likelihood of rejecting the null hypothesis:

1. *Sample size*: Statistical significance increases automatically with sample size. The larger the sample, the smaller the difference, relationship or effect needed to reject the null hypothesis. Lipsey (1990) describes the logic and procedure of selection of sample size in a quantitative study of treatment effectiveness. He frames his discussion around the concept of *design sensitivity,* which he defines as follows: "Design sensitivity... results in data that are likely to yield statistical significance if, in fact, the treatment under investigation is effective" (1990: 10). In other words, how big does sample have to be to obtain statistically significant results, if the treatment is indeed effective? He continues: "Sensitivity refers to the likelihood than the effect, if present, will be detected" (12). Lipsey suggests that a minimal total sample size of 60-80 subjects in a research involving experimental and control group comparison is adequate to achieve α=0.05, β=0.15 and ES=0.8. The current research is based on a total sample size of 300 subjects, of which the control group includes 102 subjects, the CI placebo group, 85 subjects and the MCA treatment group, 113 subjects.

2. *Level of significance*: Statistical power can be increased by lowering the level of significance needed to reject the null hypothesis. The alpha level used to determine statistical significance is $p < 0.05$, i.e., there is less than a 5% chance that a statistically significant difference, relationship or effect which was identified, in fact does not exist. In the current research, in all relevant cases, p values are smaller than 0.05, and in many cases, the p value reaches the extremely significant level of $p<0.001$.
3. *Directionality*: Directionality refers to the fact that observed differences and relationships can go in two directions. In this research, directionally is specified in the hypotheses. The fact that before carrying out the experiment, a determination is made on the basis of theory and previous research findings, that one direction is unlikely, increases the statistical power of the findings.
4. *Effect size*: An estimate of the magnitude of a difference, relationship or other effect in the population represented by a sample. This statistic is a quantitative way of describing how well the average student who received the intervention performed relative to the average student who did not receive the intervention (or who received less of it). An effect size of 0 means that on average, a student receiving the intervention did no better or worse than a student who did not receive it . Positive effect sizes mean that the average student receiving the intervention did better than the average student not receiving the intervention. The larger the positive effect size, the more powerful the intervention. Researchers consider effect sizes larger than 0.33 to have practical significance; that is, the effect of the intervention is large enough to make a significant difference on the outcome measured. This research adapts Cohen's (1988) interpretation of effect size as follows: 0.20 is small; 0.50 is medium; 0.80 is large.

SAS software was used for the analysis of the data.

Chapter III: Findings

This chapter presents the research findings in three parts, in accordance with the three clusters of hypotheses - between research groups, within sub-groups of the MCA treatment group, and additional observations.

The first part examines the effect of the metacognitive awareness guidance (MCAG) on pupils' achievements on reading assessment tasks taken from the Israeli KATs collection. The research assumption is that learners who, before they begin to process reading assessment tasks, are given written MCAG built on their prior knowledge, will exhibit a higher level of achievement on the tasks. Their achievements will be compared to the achievements of learners who performed the same tasks without any support (control group 1) and to the achievements of learners who received content instruction (CI) and read the text of the tasks before processing them (placebo group 2). Learners' achievements will be measured for each of the three assessments tasks individually, and for all of them together. Next, learners' level of achievement will be examined in relation to other research variables: gender, school, Metacognitive Strategy Index Questionnaire (MSIQ), Mental Effort (ME) and Importance and Effectiveness (IE).

The second part examines the relationship between different research variables and learners' performance in sub-groups of the metacognitive awareness treatment group. This is intended to broaden the perception of the effect of the MCAG treatment and to gain a better understanding of the results revealed in the first part of the findings.

The third part presents additional analyses and teachers' observations about the MCAG treatment in an attempt to identify links that further refer to the findings.

These three parts parallel the three clusters of research hypotheses. The first cluster of hypotheses deals with the comparison of the three groups of pupils participating in the study (between research groups).The second cluster of hypotheses focuses on the MCA experimental group only. It examines the extent to which the elements of the MCAG affect the scores of the pupils in sub-groups of the MCA experimental group.

I refer to this cluster of hypotheses as 'differences among sub-groups of the MCA experimental group' and to the third cluster – 'additional observations'.

Part 1 - Cluster I: 'Between Groups' - The effect of the experimental treatment (MCAG)

Hypothesis 1

Learners who received written Metacognitive Awareness Guidance in addition to the assessment task (learners of MCA treatment group 3) will exhibit a higher level of achievement in assessment tasks than learners who did not (learners of control group 1 and learners of the CI (content instruction and reading the passage before) placebo group 2).

The first research hypothesis considers the effect of the treatment (MCAG 1, 2, 3 - appendices J, K, L, respectively) on pupils' performance on the three reading assessment tasks - 'Paper' (task 1, "How Paper is Made" - Appendix B), 'End' (task 2, "The End" - Appendix C), and 'Dream' (task 3, "We Dream" - Appendix D). The assumption is that engaging the learners in metacognitive awareness guidance before they begin to process a task will effect their performance on that task: they will exhibit a higher level of achievement than learners who didn't receive any kind of guidance and than those who received Content Instruction and read the text before processing the task. Learners' achievements will be assessed on each of the three reading assessment tasks separately, and on all of them together ('All tasks').

Since this question is crucial to the conclusions of the research, it was important to observe it from different approaches. Thus the data was analysed through five different approaches.

Approach 1, shown in Table 8, considers the differences between the three research groups on their initial reading level, and presents their level of achievement for the three reading assessment tasks - each task separately, and all tasks together.

Approach 2, shown in Table 9, uses analysis of covariance to investigate the difference between the three research groups in achievements on the three assessment tasks, separately and all together, adjusted for learners' reading ability level.

Approach 3, shown in Tables 10 and 11, analyses all the questions together in relation to two aspects - cognitive level and level of difficulty. This is intended to assess the

effect of the treatment on pupils' achievements with respect to the three different cognitive and difficulty levels.

Approach 4, shown in Tables 12 and 13, examines the interaction between the treatment, gender of pupils, and level of achievement on the three assessment tasks separately and together.

Approach 5, shown in Tables 14 and 15, examines the interaction between the treatment, the socioeconomic level of the school and level of achievement on the three assessment tasks separately and together.

Hypothesis 1 - Approach 1 - Table 8

To begin with, a one-way analysis of variance (ANOVA) was performed on the reading ability score ('Reading'). This score is the mean of the three control variables: the scores on the standardised reading comprehension test and the reading and writing grades as taken from school files. The analysis yielded no significant differences among the three research groups as shown in Table 8 ($F_{2,297} = 1.88$, $p=0.189$). The means and standard deviations, also presented in Table 8, indicate that prior to the research, the three groups did not differ in their level of reading comprehension. This determined the groups' initial comparability.

Table 8 presents pupils' achievements on the three reading assessment tasks. The results of the ANOVA performed on the scores of each of the three assessment tasks and on the achievement for all tasks, reveals a significant difference among the research groups in level of achievement for each of the tasks: 'Paper' - $F_{2,297}=38.53$, $p=0.0001$; 'End' - $F_{2,297}=34.41$, $p=0.0001$; and 'Dream' - $F_{2,297}=26.42$, $p=0.0001$. For 'All tasks' the results were $F_{2,297}=17.44$, $p=0.0001$.

The three groups differ significantly from each other in their level of achievement on each of the three reading assessment tasks and in all together. The subjects of treatment group 3 attained a significantly higher score than the control group (the non-treatment group) and the CI group that received the placebo treatment - Content Instruction and read the text of the tasks before processing them - in each of the three assessment tasks and in all tasks together, as shown in Table 8.

The Sidak t-test for multiple post-hoc comparisons was used to determine which of the mean scores differed significantly from each other. As Table 8 shows, Group 3 - the treatment group which received the metacognitive awareness guidance - was found to be significantly different, across the three reading assessment tasks - 'Paper': 3>2, 3>1; 'End': 3>2, 3>1; 'Dream': 3>1, 2>1; and 'All tasks': 3,2>1, 3>2, 2>1 . The last column of Table 8 presents the effect size (ES) of the treatment for each of the three tasks, and for all tasks together. ES values reveal a positive large effect size on 'Paper': ES=0.67, 'End': ES=0.71, and large effect size on 'All tasks': ES=0.83. This effect size indicates that the intervention made a powerful difference in the outcome measured - achievement on the reading assessment tasks.

It is important to note that pupils who were involved in processing the same reading assessment tasks, but were given a placebo treatment - content instruction (CI) and read the texts before receiving the reading assessment tasks (group 2) - scored higher than the pupils that processed the assessment tasks without any intervention (control group 1). The CI treatment made a difference on learners' achievement: group 2 scored higher on each of the three reading assessment tasks and on all tasks than group 1, as seen in Table 8.

Table 8: Mean, standard deviation, F-test and effect size for achievement on reading and on assessment tasks

Task	Research Group						$F_{2,297}$	p-value	Significant post-hoc analyses[1]	Effect Size (ES)
	Control Group 1 (N = 102)		Content Instruction Group 2 (N = 85)		Metacognitive Treatment Group 3 (N = 113)					
	Mean	SD	Mean	SD	Mean	SD				
Reading	10.51	2.66	10.45	2.30	9.92	2.71	1.88	0.189		
Paper	1.66	0.53	1.76	0.55	2.02	0.55	38.53	0.0001	3>2, 3>1	0.67
End	1.43	0.68	1.58	0.70	1.92	0.69	34.41	0.0001	3>2, 3>1	0.71
Dream	1.64	0.58	1.97	0.48	1.87	0.46	26.42	0.0001	3>1, 2>1	0.44
All Tasks	1.59	0.47	1.75	0.47	1.96	0.42	17.44	0.0001	3>2>1, 3>1	0.83

[1] post-hoc comparisons were performed using the Sidak t-test for multiple comparisons

Hypothesis 1 - Approach 2 - Table 9

Analysis of covariance (ANCOVA) enables us to assess differences between groups on a single dependent variable after the effect of one or more covariants are statistically removed. The most relevant covariant to be considered in this study is reading ability prior to the experiment. The covariant 'reading' is a composite score on three variables: the score on the standardised reading comprehension test, and reading and writing grades as taken from school files. The analysis performed here allows us to see the differences between achievements on the reading assessment tasks after the effect of the learners' prior level of reading ability is removed. As shown in Table 9, the ANCOVA yields significant differences among the three groups. The significant difference in level of achievement on each of the reading assessment tasks, separately and all together, holds after the removal of the covariant effect - 'Paper': $F_{2,296}$=21.29, p=0.0001; 'End': $F_{2,296}$=22.63, p=0.0001; 'Dream': $F_{2,296}$=14.19, p=0.0001; and 'All tasks': $F_{2,296}$=34.29, p=0.0001.

Post-hoc analysis (Sidak t-test) indicates that pupils who received metacognitive awareness treatment outperformed the subjects of the control group (non-treatment group) on each of the three assessment tasks separately and on all the tasks together, and outperformed the Content Instruction (CI) group which received CI and read the text before on two of the assessment tasks separately and on all the tasks together. This higher level of performance holds after the removal of reading ability prior to the research - 'Paper': 3>2,1; 'End': 3>2,1; 'Dream': 3>1 and 'All Tasks': 3>2,1.

Table 9: ANCOVA on achievement adjusted for reading ability

Task	Research Group			$F_{2,295}$	p-value	Significant post-hoc analyses[1]
	Control Group 1 (N = 102)	Content Instruction Group 2 (N = 85)	Metacognitive Treatment Group 3 (N = 113)			
	Mean	**Mean**	**Mean**			
Paper	1.64	1.73	2.05	22.38	0.0001	3>2, 1
End	1.40	1.54	1.96	23.71	0.0001	3>2,1
Dream	1.62	1.95	1.89	14.09	0.0001	3>1, 2>1
All Tasks	1.57	1.73	1.99	37.66	0.0001	2>1, 3>2,1

[1] post-hoc comparisons were performed using the Sidak t-test for multiple comparisons.

Hypothesis 1 - **Approach 3 - Tables 10 and 11**

As described in the section "**Treatments and Materials**" and in Table 3, the 34 questions on the three assessment tasks are ranked by the developers of the KATs according to three cognitive and difficulty levels as shown in appendices P, Q and R. The score of each cognitive and difficulty level is computed as the sum of the scores of each question.

Reading assessment task 1 - "How paper is made"

Cognitive Level:	Level 1 (easy)	- 6 questions
	Level 2 (intermediate)	- 1 question
	Level 3 (difficult)	- 10 questions
Level of difficulty:	Level 1 (easy)	- 1 question
	Level 2 (intermediate)	- 8 questions
	Level 3 (difficult)	- 3 questions

Reading assessment task 2 - "The End"

Cognitive Level:	Level 1 (easy)	- No questions
	Level 2 (intermediate)	- 3 questions
	Level 3 (difficult	- 7 questions
Level of difficulty:	Level 1 (easy)	- No questions
	Level 2 (intermediate)	- 3 questions
	Level 3 (difficult)	- 7 questions

Reading assessment task 3 - "We Dream"

Cognitive Level:	Level 1 (easy)	- 5 questions
	Level 2 (intermediate)	- No question
	Level 3 (difficult)	- 2 questions
Level of difficulty:	Level 1 (easy)	- 3 questions
	Level 2 (intermediate)	- No questions
	Level 3 (difficult	- 4 questions

The scores on the answers to the questions above range from 0 to 3.

Table 10 presents achievement on each of the three cognitive levels on the three reading assessment tasks (all 34 questions). Table 11 presents achievement on each of the three levels of difficulty for the 34 questions.

As shown in Tables 10 and 11, there is a significant difference between groups in achievement on the three reading assessment tasks (34 questions) in respect to the three cognitive levels and the three levels of difficulty.

Looking at the mean scores of three levels of difficulty and three cognitive levels, the MCAG treatment is seen to have been effective and productive in respect to questions on levels 2 and 3. No such effect was identified on questions of level 1 - the easy questions. This pattern was established and confirmed by the value of the effect size, as shown in the last column of Tables 10 and 11. The effect size on questions of cognitive and difficulty level 3 (the most difficult questions) are large positive levels of effect size: ES=0.91 (cognitive level 3) and ES=1.00 (level of difficulty 3).

These large positive values of the effect size empower the written metacognitive awareness guidance intervention effect, especially on the most difficult questions. In comparison, the ES value on level 1 questions was found to be a positive small effect size (ES=0.48, ES=0.33), and on level 2 questions was found to be a positive small effect for cognitive level (ES=4.2) and a positive medium effect (ES=0.61) for level of difficulty.

To determine significant effects, post-hoc tests (Sidak t-tests) were performed as shown in Tables 10 and 11. Treatment group 3, which received metacognitive awareness guidance performed significantly better on the three cognitive levels and the three levels of difficulty for all 34 questions and is indicated as the one that makes the significant difference. Nevertheless, the Sidak t-test indicated that group 2 - the group that got Content Instruction (CI) and read the passage before the task, was the group that made the significant difference between the groups on level 1 difficulty questions (easy questions that test remembering facts and details). That is, subjects of group 2 performed significantly better on questions of level 1 difficulty: $F_{2,297}=3.88$, $p=0.022$, 2>1. This specific finding and the differences in levels of significance will be addressed in the chapter **Discussion and Conclusions.**

Table 10: Mean, standard deviation, F-test and effect size for achievement on three cognitive levels

Cognitive Level	Research Group						$F_{2,297}$	p-value	Significant post-hoc analyses[1]	Effect Size (ES)
	Control Group 1 (N = 102)		Content Instruction Group 2 (N = 85)		Metacognitive Treatment Group 3 (N = 113)					
	Mean	SD	Mean	SD	Mean	SD				
Level 1	2.20	0.59	2.53	0.51	2.45	0.45	11.12	0.0001	3>1, 2>1	0.48
Level 2	1.69	0.75	1.60	0.71	1.97	0.60	8.06	0.0004	3>1, 3>2	0.42
Level 3	1.24	0.51	1.36	0.53	1.71	0.52	23.13	0.0001	3>2, 3>1	0.91

Table 11: Mean, standard deviation, F-test and effect size for achievement on three levels of difficulty

Level of Difficulty	Research Group						$F_{2,297}$	p-value	Significant post-hoc analyses[1]	Effect Size (ES)
	Control Group 1 (N = 102)		Content Instruction Group 2 (N = 85)		Metacognitive Treatment Group 3 (N = 113)					
	Mean	SD	Mean	SD	Mean	SD				
Level 1	2.39	0.62	2.58	0.52	2.56	0.40	3.88	0.022	2>1	0.33
Level 2	1.55	0.60	1.53	0.62	1.91	0.58	13.44	0.0001	3>1, 3>2	0.61
Level 3	1.14	0.49	1.43	0.51	1.65	0.52	28.07	0.0001	3,2>1, 3>2, 2>1	1.00

[1] post-hoc comparisons were performed using the Sidak t-test for multiple comparisons.

Before drawing any conclusion concerning hypothesis 1, it was also important to test whether there were any interaction effects of the control variables 'Gender' and 'School' on achievements on the three reading assessment tasks.

Hypothesis 1 - Approach 4 - Tables 12 and 13

This approach examines the results according to gender of the pupils: N=300, N_{boys}=160, N_{girls}=140 (Table 12) to determine whether gender had any influence on achievement.

Two-way ANOVA was performed on the achievement scores (for each assessment task and for all three together) by 'Treatment' and 'Gender'. Results show no significant interaction between 'Gender' and 'Treatment', indicating that the treatment effects the boys' and girls' levels of achievement in the same way (Table 13: 'Paper': p=0.89; 'End': p=0.057; 'Dream': p=0.60; 'All Tasks': p=0.98).

As shown in Table 13 (column 2 - 'Treatment'), a high level of significance is maintained for each of the assessment tasks and for all of them together for the treatment group irrespective of gender ($p<0.0001$).

Table 12: Mean and standard deviation of achievement by group and gender

Tasks	Control Group 1				Content Instruction Group 2				Metacognitive Treatment Group 3			
	Boys		Girls		Boys		Girls		Boys		Girls	
	N=47		N=55		N=48		N=37		N=65		N=48	
	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD
Paper	1.61	0.53	1.70	0.53	1.72	0.60	1.81	0.49	2.01	0.53	2.03	0.59
End	1.35	0.65	1.49	0.71	1.44	0.74	1.76	0.62	1.80	0.71	2.09	0.63
Dream	1.49	0.58	1.77	0.55	1.99	0.45	1.94	0.51	1.77	0.44	2.00	0.47
All tasks	1.51	0.46	1.66	0.48	1.70	0.50	1.83	0.43	1.89	0.42	2.04	0.42

Table 13: Results of ANOVA on achievement by treatment and gender

Task	Source of Variation	df	F	P value
Paper	Treatment	2	12.16	0.0001
	Gender	1	1.10	0.30
	Treatment by Gender	2	0.12	0.89
	Error	294		
End	Treatment	2	10.95	0.0001
	Gender	1	7.99	0.005
	Treatment by Gender	2	2.90	0.057
	Error	294		
Dream	Treatment	2	14.55	0.0001
	Gender	1	9.79	0.0018
	Treatment by Gender	2	0.51	0.60
	Error	294		
All tasks	Treatment	2	17.69	0.0001
	Gender	1	7.25	0.0075
	Treatment by Gender	2	0.02	0.98
	Error	294		

Hypothesis 1 - Approach 5 - Tables 14 and 15

As described in Chapter 2 - Sampling, four different schools in the greater Tel-Aviv area participated in the research. Two of the schools are located in upper middle class neighbourhoods - school G and school BR. The other two - school K and school BL - are located in lower middle class neighbourhoods. In order to determine whether the treatment affected pupils in upper middle class schools in the same way as it affected those in lower middle class schools, two-way ANOVA was performed on the achievement scores (on each of the three assessment tasks and on all together) by 'Treatment' and 'School'. One school in each category, school G and school K, were used in the analysis.

The results show no significant interaction between school and treatment (see Table 14) indicating that the treatment affected the upper middle class school and the lower middle class school similarly. The interaction between school and treatment can be seen in Table 15: $p=0.337$, $p=0.278$, $p=0.151$ and $p=0.107$ for the dependent variables 'Paper', 'End', 'Dream', and 'All tasks', respectively. Again, the only statistically significant effect on pupil achievement was the treatment ($p=0.029$, $p=0.018$, $p=0.0006$, $p=0.0009$).

Table 14: Mean and standard deviation of achievement by group and school (for schools G and K)

Tasks	Control Group 1				Content Instruction Group 2				Metacognitive Treatment Group 3				All Groups			
	School G		School K		School G		School K		School G		School K		School G		School K	
	N=32		N=30		N=32		N=29		N=31		N=27		N=95		N=86	
	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD
Reading	10.28	3.08	9.77	2.86	10.31	2.28	9.66	2.11	11.39	1.86	8.96	2.44	10.65	2.49	9.48	2.49
Paper	1.88	0.49	1.35	0.48	1.92	0.57	1.49	0.56	2.22	0.38	1.51	0.56	2.00	0.51	1.45	0.53
End	1.38	0.82	1.21	0.68	1.38	0.78	1.49	0.68	2.01	0.61	1.59	0.78	1.59	0.79	1.42	0.72
Dream	1.62	0.67	1.62	0.60	1.84	0.52	1.91	0.42	1.96	0.52	1.73	0.52	1.81	0.59	1.75	0.53
All Tasks	1.68	0.51	1.37	0.44	1.75	0.51	1.59	0.47	2.10	0.33	1.58	0.42	1.84	0.49	1.51	0.45

Table 15: Results of ANOVA on achievement by group and school

Task	Source of Variation	df	F	P value
Paper	Treatment	2	3.59	0.029
	Gender	1	53.2	0.0001
	Treatment by Gender	2	1.09	0.337
	Error	175		
End	Treatment	2	4.09	0.018
	Gender	1	0.44	0.51
	Treatment by Gender	2	1.29	0.278
	Error	175		
Dream	Treatment	2	7.69	0.0006
	Gender	1	2.21	0.139
	Treatment by Gender	2	1.91	0.151
	Error	175		
All tasks	Treatment	2	7.34	0.0009
	Gender	1	23.54	0.0001
	Treatment by Gender	2	2.26	0.107
	Error	175		

From Tables 12, 13, 14 and 15 above, it is clear that the subjects of treatment group 3 who received metacognitive awareness guidance reached a higher level of achievement on the three assessment tasks, irrespective of gender or school characteristics.

The analysis described above (approaches 1 through 5) supports the first hypothesis of this research. The assumption is that increasing learners' metacognitive awareness by offering them written metacognitive awareness guidance (MCAG) built on their prior knowledge, before they begin to process a reading assessment task, will effect their achievement on these tasks. The achievements of the MCA treatment group, compared to the achievements of learners that processed the same reading task taken from the Israeli KATs collection without any interference (control group 1), and to the achievements of learners who received content instruction (CI) and read the text before processing the task (placebo group 2), were significantly higher.

Hypothesis 2

Learners who received written Metacognitive Awareness Guidance in addition to the assessment task (learners of MCA treatment group 3) will show a higher level of metacognitive awareness (measured by the Metacognitive Strategy Index questionnaire - MSIQ - a questionnaire designed to measure learners' metacognitive awareness) than learners who did not receive the metacognitive guidance (learners of control group 1 and learners of the CI (content instruction and reading the passage before) placebo group 2).

At least fourteen days after completing the three reading assessment sessions, learners in the three groups received the Metacognitive Strategy Index Questionnaire (MSIQ, see Measured Variables and Instruments, and Appendix I). The MSIQ was based on a questionnaire designed by Schmitt to measure the awareness of metacognitive reading strategies of students who participated in a meta-comprehension training study (Schmitt, 1988). The score on the MSIQ indicated the students' level of awareness of metacognitive reading strategies: the higher the score, the higher the level of awareness. It is important to remember that the MSIQ is a self-report instrument, and therefore what can be concluded from it is that pupils with a higher MSI score are more aware of (know about, heard about and/or remember) metacognitive reading strategies. We cannot tell from the score whether or not pupils actually use the strategies they report that they use. However, an adequate level of awareness is indispensable (though not necessarily sufficient) for using the strategies.

The hypothesis is that increasing learners' metacognitive awareness by offering them written metacognitive awareness guidance built on their prior knowledge will effect their awareness of metacognitive reading strategies which, in turn, will result in a higher score on the MSIQ. More specifically, the research assumption is that not only will metacognitive awareness guidance facilitate pupils' learning and improve their achievement on the specific reading assessment task, but it will also increase their awareness of metacognitive reading strategies. They will remember and be able to report on such strategies fourteen days after the last reading assessment session.

It is important that results relating to such a cardinal assumption be analysed through various approaches. The first approach examines the total score on the MSIQ (scores

can range from 0 to 17 - one point for each correct answer). The second approach examines the three parts of the reading process separately: Before reading - questions 1-7 (MSI-B; scores range from 0 to 7), During reading - questions 8-13 (MSI-D; scores range from 0 to 6), and After reading - questions 14-17 (MSI-A; scores range from 0 to 4). The third approach examines the six metacognitive strategies as measured by the MSIQ:

- Predicting and Verifying - Questions 1, 3, 11, 12 (MSIQ-1 - scores range from 0 to 4)
- Previewing - Question 2 (MSIQ-2 - scores range from 0 to 1)
- Purpose Setting - Questions 4, 6, 14 (MSIQ-3 - scores range from 0 to 3)
- Self-questioning - Questions 5, 10 (MSIQ-4 - scores range from 0 to 2)
- Drawing on Background Knowledge - Questions 7, 13, 16, 17 (MSIQ-5 - scores range from 0 to 4)
- Summarising and Applying Fix-up Strategies - Questions 8, 9, 15 (MSIQ-6 - scores range from 0 to 3)

The fourth approach examines the awareness of the specific strategies promoted in this research - BCD: Building, Creating & Discovering relevant prior knowledge (questions 3, 5, 6, 7, 13, 16, 17 - MSQ-BCD - scores range from 0 to 7). The BCD is one of the principles on which the metacognitive awareness guidance activity (see Chapter 2) is based. The score for each category is computed as the sum of the scores of the relevant questions.

It is assumed that the metacognitive awareness guidance, in addition to its effect on the level of achievements and pupils' performance, increases pupils' awareness of metacognitive reading strategies.

One way ANOVA performed on the total score of the MSIQ administered 14 days after the completion of the third reading assessment session showed significant differences among the three groups in their awareness of metacognitive reading strategies: $F_{2,297}=11.67$, $p=0.0001$ (Table 16 - MSIQ-T).

Regarding the level of awareness before, during and after reading, significant differences were found among groups only 'before reading': $F_{2,297}=26.71$, $p=0.0001$ (Table 16 - MSI-B). The results showed no significant differences among the groups in their awareness of strategies in the 'during' and 'after' portions of the questionnaire.

Considering the fact that the written metacognitive awareness guidance, given to the metacognitive awareness group, promoted and fostered the metacognitive reading strategy 'before reading', the linkage between the metacognitive treatment and higher level of awareness is revealed.

The link between the metacognitive treatment and a higher level of awareness of reading strategies is strengthened by the findings regarding the six metacognitive strategies as measured by the MSIQ, five of which show significant differences among the groups (Table 16 - MSIQ-1 - MSIQ-5). Group 3, the metacognitive treatment group, demonstrated the highest level of awareness of the metacognitive reading strategies for predicting and verifying: $F_{2,297}=9.91$, $p=0.0001$ (MSIQ-1), purpose setting: $F_{2,297}=10.49$, $p=0.0001$ (MSIQ-3), previewing: $F_{2,297}=6.47$, $p=0.001$ (MSIQ-2), self-questioning: $F_{2,297}=5.6$, $p=0.0041$(MSIQ-4) and drawing on background knowledge: $F_{2,297}=3.65$, $p=0.002$ (MSIQ-5). Four of these strategies, which revealed significant differences between groups, were promoted in the written metacognitive awareness guidance (see Chapter 2).

Regarding the BCD strategies, building, creating, and discovering prior knowledge, which is one of the principles of the metacognitive awareness guidance activity, the group that received metacognitive awareness guidance performed significantly better on this category than the other groups: $F_{2,297}=12.81$, $p=0.0001$ (Table 16 - MSI-BCD).

The Sidak t-test showed that group 3 - the MCA treatment group - scored significantly higher than control group 1 and CI placebo group 2, and demonstrated a significantly higher level of awareness of metacognitive reading strategies in each of the above categories.

The findings above confirm the connection between the MCAG and awareness of metacognitive reading strategies. The MCA treatment group demonstrated a higher level of awareness fourteen days after the last reading assessment session.

Additional support for this connection is seen in the findings regarding 'summarising and applying fix-up strategies'. This metacognitive reading strategy was not mentioned in the MCAG either directly or indirectly. It is not surprising, therefore, that no significant difference was found in this category: $p=0.116$ (Table 16 - MSIQ-6).

The connection between the written MCAG and a high level of awareness of metacognitive reading strategies is empowered by the value of the effect size (ES). Three categories in the MSIQ with the most direct and strongest link to the written MCAG - MSI-B (before reading), MSIQ-3 (reading with a purpose promotes active strategic reading) and MSI-BCD (building, creating and developing relevant schemata) - have the largest positive ES: 0.92, 0.62 and 0.64, respectively. The only reading strategy that wasn't mentioned, directly or indirectly, in the written MCAG, MSIQ-6 (summarising and applying fix-up strategies), has a negative effect size: ES=-0.07.

The above analysis supports the second hypothesis of the research. Learners who received written Metacognitive Awareness Guidance in addition to their assessment task (learners of MCA treatment group 3) showed a significantly higher level of metacognitive awareness.

Table 16: Mean, standard deviation, F-test, and effect size on MSIQ

MSIQ parts	Research Group						$F_{2,297}$	p-value	Significant post-hoc analyses[1]	Effect Size (ES)
	Control Group 1 (N = 102)		Content Instruction Group 2 (N = 85)		Metacognitive Treatment Group 3 (N = 113)					
	Mean	SD	Mean	SD	Mean	SD				
MSIQ-T	7.25	2.94	7.71	2.87	9.14	3.16	11.67	0.0001	3>1,2	0.62
MSI-B	2.95	1.64	3.14	1.74	4.54	1.81	26.71	0.0001	3>1,2	0.92
MSI-D	2.48	1.36	2.60	1.26	2.66	1.38	0.53	0.59		0.13
MSI-A	1.81	1.15	1.96	1.03	1.94	1.18	0.50	0.607		0.11
MSIQ-1	1.81	1.14	1.65	2.35	1.28	1.12	9.91	0.0001	3>1,2	0.48
MSIQ-2	0.67	0.47	0.79	0.41	0.87	0.34	6.47	0.0018	3>1	0.49
MSIQ-3	1.17	0.7	1.26	0.9	1.65	0.83	10.49	0.0001	3>1,2	0.62
MSIQ-4	0.99	0.72	1.16	0.75	1.33	0.74	5.6	0.0041	3>1	0.46
MSIQ-5	1.33	1.12	1.39	1.23	1.74	1.26	3.65	0.0271	3>1	0.34
MSIQ-6	1.27	0.86	1.46	0.84	1.21	0.83	2.17	0.116		-0.07
MSI-BCD	2.47	1.60	2.68	1.65	3.60	1.91	12.81	0.0001	3>1,2	0.64

[1] post-hoc comparisons were performed using the Sidak t-test for multiple comparisons.

Hypothesis 3

Learners who received written Metacognitive Awareness Guidance in addition to the assessment task (learners of MCA treatment group 3) will report a higher level of mental effort (measured by the Mental Effort questionnaire (ME) - a questionnaire designed to measure learners' mental effort) invested during the processing of assessment tasks than learners who did not receive the metacognitive guidance (learners of control group 1 and learners of the CI (content instruction and reading the passage before) placebo group 2).

Immediately after processing the first reading assessment task, subjects of each group were asked to report on their level of Mental Effort (ME) expenditure regarding the activity that they had just performed (Appendix E). The ME questionnaire consisted of five questions in which the pupils were asked to indicate the level of mental effort that they invested in the activity on a 5-point Likert scale.

The decision to consider the mental effort expenditure of research subjects as one of the research variables is drawn from the argument that learning is strongly influenced by the amount of mental effort that learners invest in processing learning materials (Salomon 1981, 1983).

The research hypothesis assumed that learners who receive written Metacognitive Awareness Guidance in addition to their assessment task (learners of the MCA treatment group 3) would report higher level of mental effort. Looking at the means and standard deviation as shown in Table 17, a pattern can be identified. Subjects that in addition to the reading assessment tasks received Content Instruction (CI), and read the text before (subjects of placebo group 2), systematically reported on a higher level of Mental Effort expenditure while processing the reading assessment tasks. They reported on a higher level of "amount of thought put into the reading activity" (ME-1), on a higher level of "thinking about what they are doing during the reading activity" (ME-2), on a higher level of "concentrate while they were doing the activity" (ME-3), on a higher level of "interest" (ME-4), and a higher level of innovation (ME-5).

One way ANOVA analysis yielded significant differences among groups regarding the level of mental effort expenditure during the activity - ME total score: p=0.008.

As shown in Table 17, no significant differences were found in four of the five ME questions: ME-1: $F_{2,297}$=1.71, p=0.18; ME-2: $F_{2,297}$=0.99, p=0.37; ME-3: $F_{2,297}$=2.22, p=0.11; ME-5: $F_{2,297}$=2.6, p=0.076. The only question that showed a significant difference was ME-4: $F_{2,297}$=7.4, p=0.0007.

Post-hoc comparisons (Sidak t-tests) for ME-4 revealed that the CI group 2 was the one which made a significant difference. This finding supports other research findings (Tobias 1994; Renninger et al. 1992) that identified a relationship between the amount of mental effort invested in a task and the level of interest. Learners of CI group 2 reported a higher level of mental effort and a significantly higher level of interest. As indicated in Chapter 2, the reason may be related to the activity: reading the content instructions and the text before processing the reading assessment task was more interesting to them and thus made them invest more mental effort. The same explanation may relate to the innovation factor (ME-5). The fact that the reading activity that they were given differs from other reading activities they had done in school caused them to invest a higher level of mental effort. This explanation is supported by teachers' interviews as described in cluster 3 – additional observations.

It is important to note that learners who received metacognitive treatment (Treatment Group 3) reported on a lower level of mental effort than the learners who received content instruction, however, their level on each of the five elements of the Mental Effort questionnaire was higher than that reported by the non-treatment control group. As a whole, group 2 reported on a higher level of mental effort expenditure while processing the tasks.

This stands in opposition to the research assumption in hypothesis 3.

Table 17: Mean, standard deviation, F-test and effect size on ME level by treatment

Item	Research Group						$F_{2,297}$	p-value	Significant post-hoc analyses[1]
	Control Group 1 (N = 102)		Content Instruction Group 2 (N = 85)		Metacognitive Treatment Group 3 (N = 113)				
	Mean	SD	Mean	SD	Mean	SD			
ME-T	3.38	0.62	3.69	0.69	3.54	0.73	4.87	0.008	2>1
ME1	3.21	1.13	3.40	1.17	3.48	1.01	1.71	0.18	
ME2	3.54	1.05	3.75	1.05	3.65	1.02	0.99	0.37	
ME3	3.77	0.95	4.04	0.96	3.76	1.05	2.22	0.11	
ME4	3.43	0.93	3.99	0.98	3.62	1.06	7.40	0.0007	2>3,1
ME5	2.95	1.06	3.29	1.09	3.19	1.08	2.60	0.076	

[1] post-hoc comparisons were performed using the Sidak t-test for multiple comparisons.

Hypothesis 4

Learners who received written Metacognitive Awareness Guidance in addition to the assessment task (learners of MCA treatment group 3) will report a higher level of importance and effectiveness (measured by the Importance and Effectiveness questionnaire - IE) than learners who didn't receive the metacognitive guidance (learners of the CI (content instruction and reading the passage before) placebo group 2).

In addition to the mental effort self-report, learners in CI group 2 - and MCAG treatment group 3 - were asked to report on the importance and effectiveness of the intervention they experienced. The assumption of this hypothesis is that learners who received metacognitive awareness guidance will recognise the impact of this kind of guidance and will report on higher level of importance and effectiveness. The report consisted of six questions given to pupils as Part 2 of their Mental Effort questionnaire. Three of the items were multiple choice and three were yes/no questions (Appendices F, G - Part 2). Learners were asked to specifically consider the intervention - the MCAG or the CI and reading the text. They were asked to assess the intervention on the basis of six factors: it "helps to understand" - IE-6; "helps to answer the question" - IE-7; "helps to give a better answer" - IE-8; "is a good idea" - IE-9; "is interesting" - IE-10; and "would like to get more such reading activities" - IE-11.

On four of the factors no significant differences were found. The treatment group and the CI placebo group reported on a similar level of importance and effectiveness of the intervention, as shown in Tables 18 and 19.

Analysis of variance was performed on the multiple choice questions (Table 18) and yielded no significant differences for IE-6 ("helped to understand..."): $T_{(196)} = 0.732$, $p=0.465$; and IE-7 ("helped to answer..."): $T_{(196)} = -0.742$, $p=0.459$.

To the question "To what extent did part one of the reading activity help you to understand the reading passage better?", the answers were as follows:

It helped me a lot	CI Group	48%,	MCA Group	56%
It helped me a little	CI Group	43%,	MCA Group	33%
It didn't help me at all	CI Group	8%,	MCA Group	10%
It confused me	CI Group	1%,	MCA Group	1%

A Chi-square test for yes/no questions was performed and yielded no significant differences between the two groups for IE-8 ("helps give a better answer..."): $\chi^2_{(1)} = 0.176$, p=0.67; and IE-10 ("get more reading activities.."): $\chi^2_{(1)} = 2.01$, p=0.157.

Of learners who were given the MCAG treatment, 78.8% reported that it helped them to give better answers to the question. On the same question, 81.2% of the pupils in the CI group reported that the treatment helped them to give a better answer (Table 19, IE-8).

For two factors, "interesting (Table 18 - IE-10) and "a good idea" (Table 19 - IE-11), a significant difference was found - IE-10 ("interesting"): $T_{(194.8)}$=-6.34, p=0.0001 and IE-11: $\chi^2_{(1)} = 6.96$, p=0.008.

A significantly higher number of subjects of CI group 2 found the CI and "reading the passage before" to be "very interesting" and a "good idea". These findings may be related to this group's report in the ME questionnaire that the CI treatment is very different from other reading activities that they were used to getting in school (Table 17 - ME-5).

The results of the IE questionnaire do not show any kind of pattern or direction. As a whole, we can conclude that hypothesis 4 is not supported. The assumption that learners who received written Metacognitive Awareness Guidance in addition to their assessment task (learners of the MCA treatment group 3) will report higher level of importance and effectiveness (IE) than learners who received the CI treatment and read the passage before (learners of CI placebo group 2) was not validated.

Table 18: Means, standard deviations and T-tests on IE by treatment
(Multiple choice items)

Item	Content Instruction Group 2 (N = 85)		Metacognitive Treatment Group 3 (N = 113)		T-value	df	p-value
	Mean	SD	Mean	SD			
IE-6	1.60	0.64	1.53	0.67	0.732	196	0.465
IE-7	1.45	0.72	1.52	0.70	-0.742	196	0.459
IE-10	1.51	0.65	2.21	0.90	-6.34	194.8[1]	0.0001

[1] adjusted for unequal variance

Table 19: Means, standard deviations and Chi-square test for IE
(Dichotomous items)

Item	Content Instruction Group 2 (N = 85)		Metacognitive Treatment Group 3 (N = 113)		Chi-Square[1] $df_{(1)}$	p-value
	Yes	No	Yes	No		
IE-8	81.18%	18.82%	78.8%	21.24%	0.176	0.67
IE-9	82.35%	17.65%	65.49%	34.51%	6.96	0.008
IE-11	76.47%	23.53%	67.26%	32.74%	2.01	0.157

[1] from the 2×2 Yes / No table, by group

To conclude and summarise the discussion of the first cluster of research findings, effect size (ES) analysis will be used to compare the effect of the two research treatments – Content Instruction treatment (reading the content instructions and the text before processing the reading assessment task) and MCAG treatment, in ordertreatment. This comparison enables us to determine which treatment is more effective and to assess the strength and potency of the MCAG treatment as it affects pupils' achievement.

ES analysis provides a quantitative expression of how well the treatment group performed relatively to the control group (ES of 0.33 or larger is considered to indicate the practical significance of the results of the experiment). Positive ES means that the average student that received the intervention performed better than the average student who didn't. The larger the ES, the more powerful the intervention.

Table 20 compares the effect size of the two treatments (MCAG and CI) relative to the control group for the following variables:

- The three reading assessment tasks (RATs) individually, and all tasks together
- Items from the RATs grouped according to cognitive levels 1, 2 and 3, and difficulty levels 1, 2 and 3.
- The total score on the Metacognitive Strategy Index (MSIQ-T) and on those items relating to 'before reading' (MSI-B), 'during reading' (MSI-D) and 'after reading' (MSI-A), and building, creating and discovering relevant schemata (MSI-BCD).
- Scores on the mental effort questionnaire (ME).

Table 20: Effect size of Research Variables on Outcomes

Variables	Effect Size (ES) MCA Treatment Group 3	Effect Size (ES) CI Placebo Group 2
Assessment task 1	0.67	0.18
Assessment task 2	0.72	0.22
Assessment task 2	0.71	0.22
Assessment task 3	0.44	0.61
All assessment tasks	0.83	0.34
Cognitive level 1	0.48	0.59
Cognitive level 2	0.42	-0.12
Cognitive level 3	0.91	0.23
Level of Difficulty 1	0.33	0.32
Level of Difficulty 2	0.61	-0.03
Level of Difficulty 3	1.00	0.58
MSIQ-T	0.62	0.16
MSI–B	0.92	0.11
MSI–D	0.13	0.09
MSI–A	0.11	0.11
MSI–BCD	0.64	0.13
ME	0.24	0.47

From Table 20, we can identify the following:

One. Regarding the effect of the MCA and CI treatments on pupils' achievements on the three reading assessment tasks:

1. Medium to large ES values of the MCA treatment group are revealed for assessment task 1 ('Paper' – ES=0.67), assessment task 2, ('End' – ES=0.72), assessment task 3 ('Dream' – ES=0.44), and for all three assessment tasks (ES=0.83).

2. The CI treatment group shows a negligible ES on two of the assessment tasks ('Paper' – ES=0.18 and 'End' – ES=0.22), and a small effect size (ES=0.34) for

the three tasks together which was generated by a medium ES on task 3 ('Dream' – ES=0.61).

3. The ES value of the CI treatment on assessment task 3 ('Dream'- ES=0.61) is somewhat anomalous, and may be related to the cognitive and difficulty level of the questions. On this task, over 70% of the questions are classified on the lowest cognitive and difficulty level (see Table 3).

Two. Regarding the effect of the MCA and CI treatments on pupils' achievement for the items on the three reading assessment tasks grouped according to cognitive and difficulty level:

4. Small to medium ES values of the MCA treatment are revealed for cognitive levels 1 and 2 (ES=0.48 and ES=0.42, respectively). This indicates that on those levels, the MCA treatment may have made a small difference.

5. Small and medium ES values of the MCA treatment are revealed for difficulty levels 1 and 2 (ES=0.33 and ES=0.61, respectively). This indicates that on level 2, the MCA treatment may have made a difference.

6. Very high and significant ES values of the MCA treatment are revealed for the highest cognitive and difficulty levels – level 3 (ES=0.91 and ES=1.00, respectively). This indicates that the MCA treatment is powerful and vital on these highest level questions.

7. All but one of the ES values of the CI group were lower than those of the MCA group. Low ES values of the CI treatment were found for cognitive levels 2 and 3 (ES=-0.12 and ES=0, respectively) and for difficulty levels 1 and 2 (ES=0.32 and ES=-0.03, respectively). This suggests that the CI treatment is not effective in these cases. However a medium effect size was found for the highest level of difficulty and the lowest cognitive level (ES=0.58 and ES=0.59, respectively).

Three. Regarding the effect of the MCA and CI treatments on the pupils' achievements on the metacognitive strategy index questionnaire (MSIQ), for total score – MSIQ-T, 'before reading' (MSI-B), 'during reading' (MSI-D), 'after reading' (MSI-A), and on building, creating and discovering relevant schemata (MSI-BCD), the findings were as follows:

8. Meaningless ES values of the CI treatment were found for all relevant indicators of the MSI questionnaire, ranging from 0.09 to 0.16. This suggests that the CI treatment had no effect on subjects' level of awareness of metacognitive reading strategies.

9. The analysis revealed an extremely high and significant ES value of the MCA treatment for 'before reading 'metacognitive strategies (ES=0.92). This indicates that the MCAG treatment had a powerful effect on subjects' level of awareness of before reading metacognitive strategies. This contributes to the medium to large effect size of MSI-BCD and MSIQ-T (ES=0.64 and ES=0.62, respectively).

10. ES values for MSI-D and MSI-A reflected the fact that 'during reading' and 'after reading' metacognitive strategies were not part of the MCAG treatment, and this is validated by the lack of effect found in the analysis (0.13 and 0.11, respectively).

Four. Regarding the effect of the MCA and CI treatments on the subjects' level of mental effort expenditure while processing reading assessment task 1, the ES value for this dependant variable indicates that the CI treatment had a medium effect, while the MCAG treatment had a minimal effect

The above findings fortify and strengthen the findings of cluster 1 above, that relate to the effect of MCAG treatment on subjects' level of achievement.

Part 2 - Cluster II: 'Differences among sub-groups of the MCA Treatment Group'

The second cluster of hypotheses examines the relationship between the different research variables and learners' performance within the metacognitive awareness treatment group. This is intended to broaden the perception of the effect of the MCAG treatment and to provide a better understanding of the result revealed by the first group of findings. This cluster focuses only on the MCA experimental group. It examines to what extent the score of the pupils on the three MCA questionnaires affects the score of pupils in various sub-groups of the MCA experimental group. I refer to this cluster of hypotheses, as 'differences among sub-groups of the MCA experimental group' despite the fact that the statistical techniques employed (correlation and regression coefficients) do not result in logical separation into sub-groups within the MCA experimental group

Metacognitive awareness guidance (MCAG) was given only to treatment group 3 (MCA group, N=113) for each of the three reading assessment tasks. It was given to the pupils in this group before performing the assessment tasks. After answering the metacognitive awareness questions, they were asked to say out loud, "*Now I know a lot about.... What I know about ... will help me to understand the passage. Now it will be easier for me to study the passage*", and only then to signal that they were ready to process the assessment task. The written metacognitive awareness guidance is presented in Appendix J - MCAG-1 for assessment task 1, in Appendix K - MCAG-2 for assessment task 2, and in Appendix L - MCAG-3 for assessment task 3.

The MCAG has four main aims, based on four major metacognitive awareness principles. The *first* is to generate readiness, arouse interest and create expectations. In this research, these are accomplished by using such metacognitive awareness methods as providing context information, offering relevant background knowledge and creating advance organisers. The *second* aim is to build, create, discover relevant schema (BCD). These are achieved by raising problems and suggesting possible answers, by guiding learners to use context information, by asking them to make predictions and judgements and by directing them to focus on what they already know about a topic. The *third* aim is to activate relevant prior knowledge by asking learners to write their own thoughts and knowledge about the subject, by using the cloze

method to extend their thinking about the subject and by encouraging learners to become involved in active writing. The *fourth* aim is to raise the learners' metacognitive awareness (MCA) of the effect of utilising their existing prior knowledge on the performance and outcome of an assessment task, by diverting their tendency to respond impulsively by strongly encouraging them to stop and think before processing an assessment task, and by encouraging them to use direct explicit self-talk. The specific principles and methods of the metacognitive awareness guidance (MCAG) were summarised in Tables 5a, 5b, and 5c. The theoretical basis, principles and methods of implementation of the MCAG were described, discussed and analysed in Chapter 2 - The Empirical Framework.

To examine the hypotheses of the second cluster, a correlation technique - *Pearson's product-moment correlation coefficient* - was used. The purpose of correlation analysis is to explore and discover a possible relationship between two or more research variables, and to determine whether achievement on one of the variables relates to achievement on another variable. The correlation coefficient expresses the degree of relationship between two or more variables, and ranges between -1.00 and +1.00. The statistical significance of the correlation coefficient is indicated by 'p' values - * $p<0.05$, ** $p<0.01$, *** $p<0.001$. Statistical significance is important for the purpose of prediction.

Hypothesis 5

In the treatment group (learners who received written metacognitive awareness guidance- MCAG - in addition to the assessment tasks), learners who show a high level of activation of relevant schemata will reach a higher level of achievement in the assessment tasks.

The first hypothesis in this cluster refers to the relationship between two main research variables: achievement on reading assessment tasks (on each of the three separately and on all together), and achievement on the metacognitive awareness guidance questions. It is assumed that subjects who performed better on the reading assessment tasks will show a higher level of activation of the relevant schemata (MCAG score). The Pearson test was performed to determine whether there is any relationship between these variables, and if so, what its direction and magnitude are. The following

correlation matrix (Table 21) reveals that subjects' achievements on the three reading assessment tasks, on each of them separately and all of them together, are significantly and positively related to subjects' level of activating relevant prior knowledge:

1. "Paper" and MCAG-1: $r=0.63, p<0.001$
2. "End" and MCAG-2: $r=0.37, p<0.001$
3. "Dream" and MCAG-3: $r=0.23, p<0.01$
4. All Tasks and MCAG-M: $r=0.64, p<0.001$

The magnitude of the correlation coefficient and the level of statistical significance allow to draw the conclusion that the relationship between subjects' level of achievement and level of MCAG is valid and positive.

The above findings support the fifth hypothesis of the research.

Table 21: Correlation Matrix for Achievement on Reading Assessment Tasks and MCAG Questions

(N=113)

	'Paper'	'End'	'Dream'	All tasks	MCAG-1	MCAG-2	MCAG-3	MCAG-M
'Paper'	—							
'End'	** 0.30	—						
'Dream'	** 0.28	** 0.28	—					
All tasks	*** 0.72	*** 0.56	*** 0.57	—				
MCAG-1	*** 0.63	NA	NA	*** 0.60	—			
MCAG-2	NA	*** 0.37	NA	*** 0.50	*** 0.52	—		
MCAG-3	NA	NA	** 0.23	*** 0.43	*** 0.53	*** 0.50	—	
MCAG-M	*** 0.59	*** 0.40	*** 0.32	*** 0.64	*** 0.78	*** 0.88	*** 0.73	—

* $p<0.05$ ** $p<0.01$ *** $p<0.001$

Hypothesis 6

In the treatment group (learners who received written metacognitive awareness guidance- MCAG - in addition to the assessment tasks), learners who show a high level of activation of relevant schemata will report on a high level of mental effort (ME) and a high level of importance and effectiveness (IE).

The second hypothesis in this cluster refers to the relationship between three research variables: subjects' level of achievements on the metacognitive awareness guidance questions, their reported level of Mental Effort (ME) expenditure while processing the reading assessment tasks, and their reports on level of Importance and Effectiveness (IE). It is assumed that subjects who demonstrated higher level of activating their relevant schemata (MCAG score), will report on a higher level of ME expenditure and on a higher level of IE on those tasks. The Pearson test was performed and the results are shown in the Table 22.

Table 22: Correlation Matrix for MCAG questions, Mental Effort, and Importance and Efficiency

	MCAG-1	MCAG-2	MCAG-3	MCAG-M	ME	IE
MCAG-1	—					
MCAG-2	*** 0.52	—				
MCAG-3	*** 0.35	*** 0.50	—			
MCAG-M	*** 0.78	*** 0.78	*** 0.23	—		
ME	** -0.23	-0.12	0.02	-0.15	—	
IE	* -0.21	0.10	0.002	0.16	*** -0.02	—

* $p<0.05$ ** $p<0.01$ *** $p<0.001$

The values of the correlation coefficients in Table 22 do not indicate a relationship between variables. A negative correlation of low significance was identified for MCAG-1 and ME ($r=-0.23$, $p<0.01$), for MCAG-1 and IE ($r=-0.21$, $p<0.05$), and for ME and IE ($r=-0.02$, $p<0.001$). Such levels of correlation coefficient do not allow us to draw any conclusions. The sixth hypothesis cannot be validated.

Hypothesis 7

In the treatment group (learners who received written metacognitive awareness guidance- MCAG - in addition to the assessment tasks), learners who show a high level of activation of relevant schemata will show a high level of metacognitive awareness according to the Metacognitive Strategy Index (MSI).

The third hypothesis in this cluster refers to the relationship between measured variables: subjects' level of achievement on the metacognitive awareness guidance questions (MCAG score), and their reported level of awareness of metacognitive reading strategies as measured by the metacognitive strategy index questionnaire (MSIQ). It is assumed that subjects who demonstrated a higher level of activating relevant schemata (MCAG score), will report on a high level of awareness of metacognitive strategies fourteen days after completion of the three reading assessment tasks. A Pearson test was performed and results are shown in Table 23.

Table 23: Correlation Matrix for MCAG and MSI

	MCAG-1	MCAG-2	MCAG-3	MCAG-M	MSIQ-T	MSI-B	MSI-D	MSI-A	MSI-BCD
MCAG-1	—								
MCAG-2	*** 0.52	—							
MCAG-3	*** 0.33	*** 0.50	—						
MCAG-M	*** 0.78	*** 0.88	*** 0.73	—					
MSIQ-T	0.03	0.04	0.07	0.04	—				
MSI-B	0.02	-0.00	0.05	0.02	*** 0.79	—			
MSI-D	0.03	0.01	0.05	0.04	*** 0.72	** 0.27	—		
MSI-A	0.01	0.12	0.06	0.08	** 0.68	** 0.28	*** 0.34	—	
MSI-BCD	0.00	0.01	-0.03	-0.00	*** 0.89	*** 0.78	*** 0.45	*** 0.68	—

* $p<0.05$ ** $p<0.01$ *** $p<0.001$

The results show no significant correlation between subjects' level of activating relevant prior knowledge and their level of awareness of metacognitive reading strategies. This finding is important and interesting especially when a significant link between subjects' achievement on the three reading assessment tasks and their level of

awareness of metacognitive reading strategies has already been established and validated (hypothesis 2 and ES values). The importance of this finding, and its potential implications will be further discussed in the chapter **Discussion and Conclusions**.

Part 3 - Cluster III: Additional Observations and Teachers' Interviews

This cluster consists of two parts. The first examines *subjects' answers on the metacognitive awareness guidance questions*. The second reports on *interviews with teachers of the MCA treatment group*, their perspective, thoughts, and lessons learned.

Subjects' responses on the metacognitive guidance questions

The findings relating to hypotheses of clusters one and two (hypotheses 1-7) showed the effect of metacognitive awareness guidance for activating prior knowledge on the pupils' level of achievement on reading assessment tasks.

Metacognitive awareness guidance items are generally graded on a scale of 1 to 3. When a Yes/No answer is called for, the score is either 0 or 3 (0 = wrong, 3 = correct). When open answers are required, the following are the criteria for each grade:

Unsatisfactory responses are those which demonstrate

- little or no use of context information, information given to the treatment subjects at the beginning of each of the MCAGs, and the knowledge they bring to the reading assessment sessions.
- little or no understanding, i.e., by providing isolated lists of information.
- little or no ability to integrate the given context information into their answer, i.e., irrelevant prior knowledge, irrelevant answer.

Partial responses are those which demonstrate

- some use of context information.
- some understanding, i.e., by providing some information.
- some ability to integrate context information into the answer, the learner using partially relevant prior knowledge that may or may not be applicable to the task, topic or issue.

Extensive responses are those which demonstrate

- use of context information, e.g., the learner clearly identifies and elaborates on the topic and considers the topic through relevant, accurate and adequate prior knowledge. Responses move beyond simple description.
- activation of prior knowledge, i.e., by linking the answer to the problem or topic.
- use of language from the semantic field of the relevant knowledge.
- use of context information and creating linkage.

For the answer keys to each of the three metacognitive tasks, see appendices T, U and V, respectively.

Subjects' responses on MCAG-1, 2 and 3 are summarised and presented in Tables 24, 25 and 26 respectively. Analysis of the answers reveals a fundamental gap between having the knowledge, on one hand, and actively using it - being able to draw appropriate generalisations and to extrapolate from them - on the other. The following are the major gaps which arose from the analysis:

- MCAG-1 (Table 24, below): In question 1, "What do you think paper is made of?", 91% of the subjects had the knowledge; they knew that paper is made of wood. However, when asked to go beyond the knowledge and extrapolate from it, such as in questions 2 and 3 ("What problem could there be...?", "What solution can you suggest...?"), only 13% and 9% respectively suggested an adequate answer.

  On question 4, this gap is sharply revealed. Subjects were asked to write a short paragraph "to fit the title 'How Paper is Made' using the following words: paper, wood, manufacture, recycle". The majority of the written paragraphs (87%) show no ability to organise knowledge into a meaningful and thoughtful frame. Most repeated the words without actually presenting any real essence or logical scheme to interconnect the bits of information they had. They were unable to utilise the information they had to make meaning in the learning activity.

- MCAG-2 (Table 25, below): In questions 1 and 3, "Do you think it will make a difference...?" and "Do you think that this fact will influence...?", 86% and 89% respectively gave the correct answer; however, when they were asked to draw conclusions and make appropriate generalisations (questions 4 and 5 - cloze), only 6% were able to actively use their knowledge and draw conclusions from it.

- MCAG-3 (Table 26, below): In question 3, "Do you think it is from the encyclopaedia?" (Yes/No), 38% answered correctly, showing a high level of knowledge, but when asked to explain why, only 10% did it adequately.

Table 24: Frequency and Percentage of Subjects' Responses on MCAG-1

(N=113)

No.	Question	Range of Answers	Frequency	Percentage
1	"What do you think paper is made of?"	0 3	10 103	8.9 91.1
2	"What problem could there be when manufacturing paper?"	0 1 2 3	 58 41 14	 50.9 36.6 12.5
3	"What solution can you suggest to the problem that you raised?"	0 1 2 3	1 63 39 10	0.9 55.4 34.8 8.9
4	"Write a paragraph to fit the title 'How Paper is Made' using the following words....."	0 1 2 3	 52 46 15	 46.4 40.2 13.4

Table 25: Frequency and Percentage of Subjects' Responses on MCAG-2

(N=113)

No.	Question	Range of Answers	Frequency	Percentage
1	"In your opinion, will there be a difference between the 2 translations?"	0 3	15 98	13.4 86.6
2	"What is the difference?"	0 1 2 3	 42 58 13	 36.6 51.8 11.6
3	"Do you think that this will influence the style of the translation?"	0 3	12 101	10.7 89.3
4	"Complete the missing words (cloze)"	0 1 2 3	 61 45 7	 54.5 39.3 6.3
5	"Complete the missing words (cloze)"	0 1 2 3	 70 36 7	 62.5 31.3 6.3

Table 26: Frequency and Percentage of Subjects' Responses on MCAG-3

(N=113)

No.	Question	Range of Answers	Frequency	Percentage
1	"Write 5 questions that you think will be answered in the passage 'We Dream'	0 1 2 3	 15 56 42	 13.4 49.1 37.5
2	"Write a possible answer to the 2 question that you chose"	0 1 2 3	1 36 69 7	0.9 32.1 60.7 6.3
3	"The sentences below....if you think it is from the encyclopaedia circle yes or no"	0 1 2 3	 25 45 43	 22.3 39.3 38.4
4	"Explain why"	0 1 2 3	 66 35 12	 58.9 30.4 10.7

From the pattern described above, repeated in subjects' answers to all three metacognitive awareness guidance tasks, it can be concluded that pupils may have the relevant knowledge regarding a specific assessment task, but the knowledge is just 'sitting' there, they do not extrapolate from it, do not explain it, nor do they actively use it to defend or justify their point of view.

As a result, their responses to questions that require explanation, analysis, conclusions or justification are in general very disappointing. Only a small number of pupils could provide satisfactory answers. The majority gave superficial responses to the questions.

Interviews with teachers of the MCA treatment group

Approximately one month after the completion of the research (the three reading sessions), each of the four teachers whose classes participated as the MCA treatment group was interviewed (Appendices X-1 - X-4).

The purpose of the interviews was to gain the teachers' perspectives and thoughts, and to discover what, if anything, they learned from participating in the research. Specifically, I wanted to find out their thoughts concerning their expectations from such a learning intervention and how they perceived its influence on their pupils' performance on reading assessment tasks. The interviews were conducted in the manner of a 'friendly conversation', after trust and confidence were established (Spradley 1979). I used the 'general interviewing guide approach' (Fontana & Frey 1994) in which I provided the teachers with guidelines prior to the interview which served as a framework within which they could express their understanding in their own words (see Appendix W - Guidelines for Teacher Interviews, and Appendices X1, X2, X3, X4, for teachers' responses).

Each interview focused on the following guidelines:

1. What were pupils' reactions to the activities of the study (both the guidance and the task itself)? Did they ask questions, or make comments, or did they only perform the tasks and hand them in?
2. Was there any effect on the learning-teaching environment in the classroom as a result of participating in the study; e.g., was there any effect on your teaching or on the learning of your pupils, or was the experiment performed and then forgotten?
3. Did anything at all change in your specific way of teaching (even at the level of thinking about your teaching)?
4. Do you think there is any pedagogical importance in metacognitive guidance of the sort your pupils experienced? Do you expect this to have an effect on teaching or assessment tasks?

Following are four major points that emerged from the interviews:

On the use of self -talk

Three of the four teachers directly mentioned the "self-talk" segment of the metacognitive awareness guidance, in which after answering the MCAG questions, pupils were asked the following:

For Reading Assessment Task 1 – "How Paper is Made"

Now, before asking your teacher for the learning task, please say these words aloud:

Now I know more about manufacturing paper.
This knowledge will help me to understand the passage.
Now it will be easier for me to study the passage.

For Reading Assessment Task 2 – "The End"

Now, before asking your teacher for the learning task, please say these words aloud:

Now I know about the poet and the translators.
What I know about the poet and the translators will help me to understand.
What I know about the poet and the translators will help me to study.

For Reading Assessment Task 3 – "We Dream"

Now, before asking your teacher for the learning task, please say these words aloud:

I know a lot about dreams.
Everything I already know helps me understand.
Everything I already know will help me to study the passage.

These activities are designed to create and raise metacognitive awareness of:

- prior knowledge (schema) of the task
- the role and function of prior knowledge in understanding and answering the assessment task questions
- the effect of using prior knowledge on their performance and outcome
- the active and dynamic nature of their existing knowledge and the need to re-examine this knowledge (vis-a-vis what they will read)

In this activity, learners were asked to use direct explicit self-talk to monitor their activities and to establish meaningful connections with their MCAG activities. The instruction to stop and observe or reflect on what they have done, why they did it, and how to make use of it was intended to restrain their spontaneous tendency to begin to answer questions immediately, without prior thought. Through the use of self-talk, the processing of assessment tasks would become less impulsive and more mindful.

The self-talk seemed to have an influence and impact on both pupils and teachers. Three of the four teachers explicitly referred to the impact of the self-talk activity:

Teacher (school 2-K):

> *Before we started the topic "Problems with water in Israel", I did some brainstorming on the subject, and the blackboard was full of words, topics, problems, names...and then one of the pupils (a weak pupil, as a matter of fact) all of a sudden said, "And now I say to myself out loud...." - you remember the activity that ends each guidance you gave. The whole class started to laugh, and I must admit that I did too* (Appendix X-2).

Teacher (school 3-BR):

> *Actually there is something that I adopted from the research. Do you remember the final part of each guidance "Now say to yourself out loud, I know..." When we finish a topic in class, I always sum up with a few points or with a summary. But now, instead of using the words "summary" or "conclusions" which I used to use, I write:*
>
> *"As a result of what we learned, I say to myself....*
> *I remember....*
> *I know...."*
>
> *This is certainly the influence of the research* (Appendix X-3).

Teacher (school 4-BR):

> *In my class, there was something very interesting in relation to my pupils' experience with this research. I don't know if in other classes there was the same reaction, but my pupils began to recite the sentence at the end of the*

guidance, "And now I say to myself out loud.... And now I know.... What I know will help me.... Now it will be easier for me to answer the questions."

This has been a joke in class ever since the research. Sometimes they say it in the proper context, and sometimes they just say it. To tell you the truth, I thought quite a bit about it, because children have a tendency to make fun of things that make sense to them, but which they aren't used to (Appendix X-4).

In addition, the teachers reported on other situations in their classes where pupils actually mentioned the MCAG:

Teacher (school 1-G):

> *After each task, I heard a number of pupils arguing and discussing the guidance questions. I didn't hear any direct reference to the reading passages of the tasks, but I did to the guidance questions. And that got me thinking, and I decided...* (Appendix X-1).

Teacher (school 3-BR):

> *After the first task, there were pupils who asked if they could do only the guidance and not do the task* (Appendix X-3).

The importance of these findings is that the pupils actually remember the exact words of the self-talk, and find it important and relevant (and maybe useful) enough to remember and repeat in another learning situation. Furthermore, one of the teachers reported that she had adopted the method and was using it in her class. Remembering is a prerequisite for internalization. The fact that the pupils remembered the self-talk part of the metacognitive awareness guidance can be one of the explanations for the higher level of metacognitive awareness of reading strategy MSI (questionnaire) as demonstrated by pupils of the MCA treatment group.

On the use of metacognitive learning strategies

A second observation that emerges from the interviews is that the teachers are familiar with metacognitive learning strategies, and use them in learning activities that they design for their classes:

Teacher (school 2-K):

> *Look, about the metacognitive guidance as you call it, I actually use questions of this sort all the time. These aren't new questions – 'headlines', 'brainstorming' and 'rays of sun' are actually the same thing.* (Appendix X-1).

Teacher (school 3-BR):

> *Regarding my teaching methods, to tell you the truth, I didn't really think about it. I always go over the title of a text with my pupils to create expectations regarding the new material which we are about to read. I didn't have enough time to really learn the subject of metacognition because it's the end of the year and we were busy with other things, but maybe next year, I'll do something with this* (Appendix X-3).

Teacher (school 4-BR):

> *I usually do guidance of this sort before every text we read, and we check the title - what does it tell us? Where is the text from? What do we expect will be written in the text and why? These are pretty routine questions; it's not new. I went over the questions you gave in the guidance a bit, and some of them are the kind we use and ask in the course of our regular teaching* (Appendix X-4).

In light of the above responses we can conclude, first, that teachers actually use metacognitive learning strategies in their classes so the pupils are familiar with the metacognitive format of questioning. Second, because teachers are unaware of how metacognitive strategies influence learning, they use the strategies as stimulation activities to increase interest and motivation and not as a metacognitive activities to check, plan, monitor, revise, regulate, and evaluate (in short – to manage) the learning activity outcome. This distinction is reinforced by the observation of one teacher:

Teacher (school 2-K):

> *Sometimes I give a homework assignment to prepare 'rays of sun' for a topic, or a list of words or topics connected to a new topic which I am about to teach. But then, a problem arises. Because these kinds of questions don't have only one correct answer, all the pupils want to read their answers, to present their 'sun', and to read the list of words they collected and explain them. And then I have to take an enormous amount of time to check their homework, because if I don't let pupils present, they are hurt and offended. Because for some reason they are more attached to that kind of homework assignment. And then imagine - everyone describes, explains and argues and we have 30 pupils in the class, it's not easy. It's a very difficult problem with this kind of homework assignment or task - this has to be taken into consideration* (Appendix X-2).

The teachers demonstrated intuitive understanding of the contribution that the MCA guidance can provide. However, they still needed reassurance:

Teacher (school 3-BR):

> *If you really discover that the grade on the task is higher because of the guidance, I think that will be interesting because actually what comes out of*

> *this is that we can affect pupils' grades without giving them the answers to specific test questions, and maybe that is the advantage of questions like this* (Appendix X-3).

The teacher of school 1-G agreed that the MCAG questions probably influenced pupils' performance and their level of achievement on assessment tasks, but raised an important issue:

> Teacher (school 1-G):
>
> *I have no doubt that their knowledge and their answers on the guidance affects their performance on the test, and what happens is that when I find that pupils who got only 10 out of 30 points on the guidance, and 30 out of 70 points on the test, I have a hard time deciding what to do about their final grade. Because if they lacked the context and the knowledge which others had, they received a lower grade. Is that fair? Do you understand my dilemma? - I don't know if it's fair to give them a 45 when now it's clear to me that if they had more background knowledge, they would get a higher grade on the test. This dilemma takes me back to the way I teach, and the whole problem of tests* (Appendix X-1).

To ensure effective implementation of the MCA methods, teachers need to be taught the theoretical background and the foundations of the learning theory. All four teachers interviewed asked to be informed about the research results. As one of the teachers said,

> *I will be very happy to know whether the pupils who received the metacognitive guidance did better on the assessment task. Maybe this would be the excuse I am looking for to justify dealing more with background things. I am not sure that that is the case. I think that sometimes it's a diversion from the main point. I hope you will tell us about the results* (Appendix X-2).

These "background things", that she described as a "waste of time" at the expense of "working, studying the actual text material", often take up a whole lesson and this frustrated her.

> *Sometimes I say to myself that it's worthwhile investing the time in the text itself, and not in what is around it. I'm willing to waste time on a question like 'what does this tell you?', 'what does this remind you of and why?', but when you get to the material, it's less interesting. And I don't need to tell you that we have to get all the material done, and it's impossible to do background stuff all the time* (Appendix X-2).

The teachers were found to need reassurance that they were really doing the right thing in spending time on metacognitive learning strategies. Instead of practising the

implementation of such strategies, they need to get a solid theoretical basis which will enable them to use metacognitive learning principles while understanding the foundations. Then, they will not need such reassurance.

The finding that the pupils are familiar with the metacognitive questions may be one explanation of the results of research hypothesis 3, which assumes that learners who received written metacognitive awareness guidance in addition to their reading assessment task would report higher level of mental effort. The results do not support the research assumption. They do, however, support other research findings that identified a relationship between the amount of mental effort invested in a task and the level of interest and innovation (Tobias 1994; Renninger et al. 1992). From the teachers' interviews, it appears that pupils are already familiar and experienced with metacognitive questions. Thus, the factor of innovation and interest does not arise.

On the use of metacognitive awareness guidance (MCAG)

Metacognitive guidance should be incorporated as an integral part of the assessment tasks, and not as a separate task before or after the process. This conclusion emerged directly from the interviews:

Teacher (school 3-BR):

> *Maybe the guidance should be shortened, or integrated into the assessment task, because the pupils concentrate and make an effort writing, and then they are told, "You're not finished; actually, now you are beginning the task." They aren't used to working that way and that's what made them a bit unsettled and displeased. I wonder if that affected their results on the task* (Appendix X-3).

Teacher (school 1-G):

> *One of the questions that recurred while my pupils were performing the three tasks was whether they would receive a grade on the metacognitive guidance as well as on the assessment task. This concerned them a great deal, especially the better pupils, possibly because they had to write more. Each time they received a task, at least 5 pupils asked again. In my instructions to them, I had told them that they would get a grade, and that the answers to the questions they answered before the task would have some weight in how I determined the final grade for the task* (Appendix X-1).

If the metacognitive guidance questions are incorporated and integrated into the reading assessment tasks, the issues of grading, length and pupils' concentration are no

longer problematic. This is an important lesson to learn: guidance, support and scaffolding should be integral parts of the learning activity/assessment.

On the use of language

The teachers related to the research intervention using language which reflected thinking and reasoning. They used such terms as "*That got me thinking and I decided to...*", "*I discovered*", "*As a result of this experience, I ...*" and "*This dilemma takes me back to the way I teach, and the whole problem of tests ...*" (Appendix X-1); "*When I thought about it, I realised that ...*", "*When I think about ... I wonder if that effected the result*", "*Now, instead of using the words 'summary' and 'conclusion', I write...*" (Appendix X-3); "*I thought quite a bit about it because...*", "*I too am interested...*" (Appendix X-4). The teachers' use of the vocabulary of thinking is a prerequisite to and an indication of future action.

Chapter IV: Discussion and Conclusions

Discussion of key findings

This chapter highlights five key findings that emerged from the analysis of the results. All five have both solid qualitative and quantitative data to support them and strong implications for establishing a theoretical-practical framework, which links assessment practice to learning theory.

The first key finding suggests that integration of metacognitive learning principles within reading assessment tasks enhances pupils' achievements and makes a significant difference in their performance. Pupils of the MCA group attained a significantly higher score on each of the three reading tasks (Hypothesis 1, Approaches 1-5, Tables 8-15). This significant difference remains after the effect of pupils' prior level of reading ability is removed (Hypothesis 1, Approach 2, Table 9).

This finding is reinforced by three additional results:

(One) No significant interaction between gender and treatment was identified. This indicates that the treatment effects boys and girls in the same way (Hypothesis 1, Approach 4, Tables 12 and 13).

(Two) No significant interaction between treatment and schools was identified. This indicates that the treatment effected pupils from upper middle class schools and from lower middle class schools similarly (Hypothesis 1, Approach 5, Tables 14 and 15).

(Three)The large positive effect size (ES=0.83) empowers the written metacognitive awareness guidance intervention effect and indicates that the intervention made a powerful difference in the outcome measured (Table 20, ES for MCA treatment).

The second key finding proposes that Metacognitive Awareness Guidance (MCAG) made the most significant difference on questions on the highest cognitive and difficulty levels (Hypothesis 1, Approach 3, Tables 10 and 11). The MCA treatment was found to be most effective and beneficial in level 2 and 3 questions (ES=0.61, ES=1.00, Table 20). Examining the reading assessment tasks in terms of cognitive and difficulty levels strengthens and fortifies the above findings. This is presented graphically in the figures below:

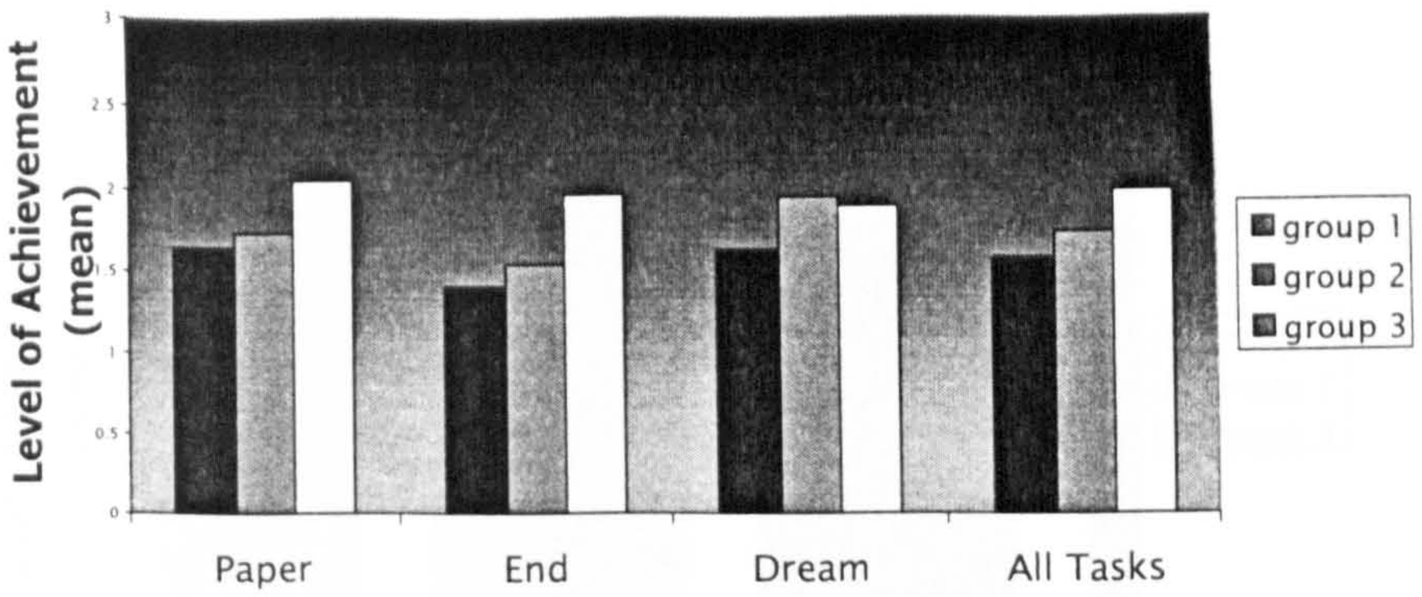

Figure 7: Pupil achievement on reading assessment tasks

Figure 7 shows the pupils' overall achievements on the three reading assessment tasks, each separately and all together. Only assessment task 3 ("We Dream") shows a different pattern: the CI placebo group scored higher than the MCA treatment group. In order to understand this finding, the reading assessment tasks were examined in terms of the difficulty and cognitive levels of the questions as determined by the developers of the KATs. In contrast with the other assessment tasks, most of the questions on assessment task 3 are of the lowest cognitive and difficulty levels. The analysis of pupils' achievements on questions of different difficulty and cognitive levels is shown in figures 8 and 9, below.

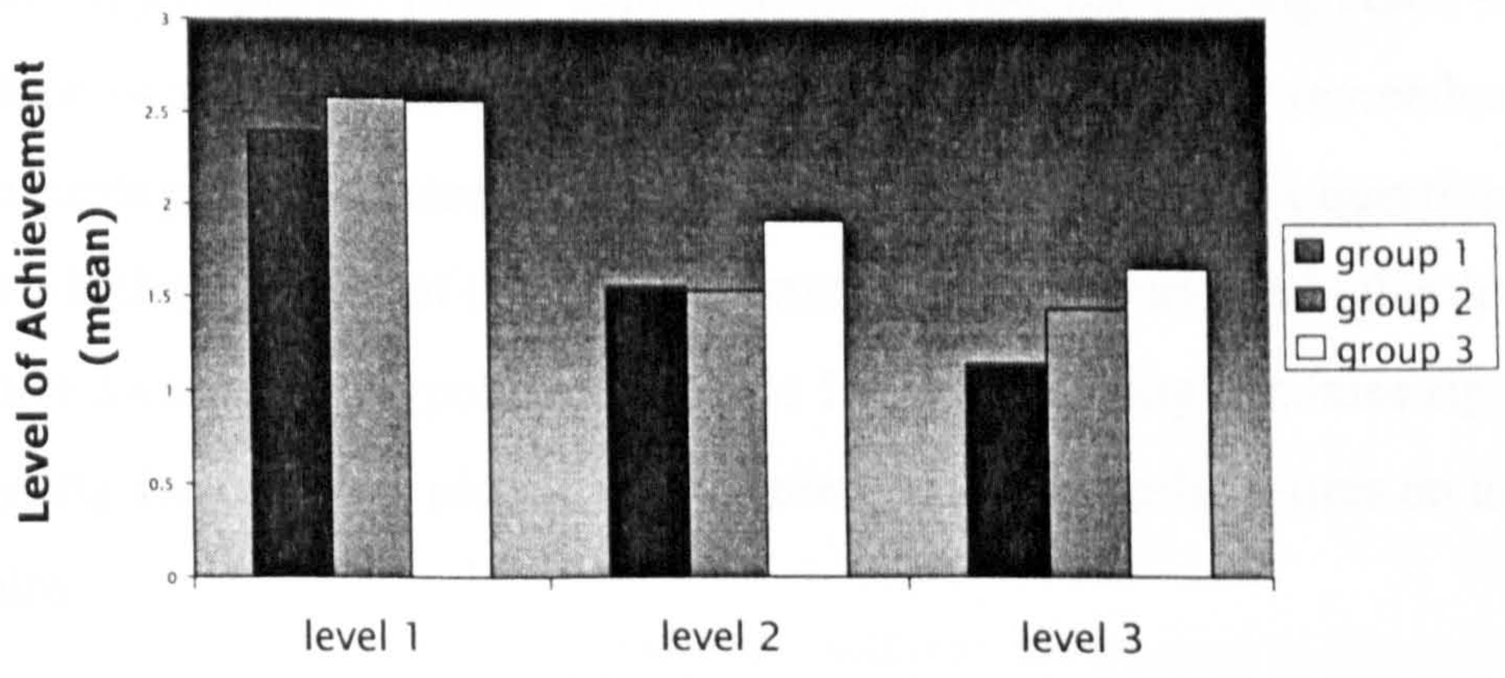

Figure 8: Pupil achievement by difficulty levels

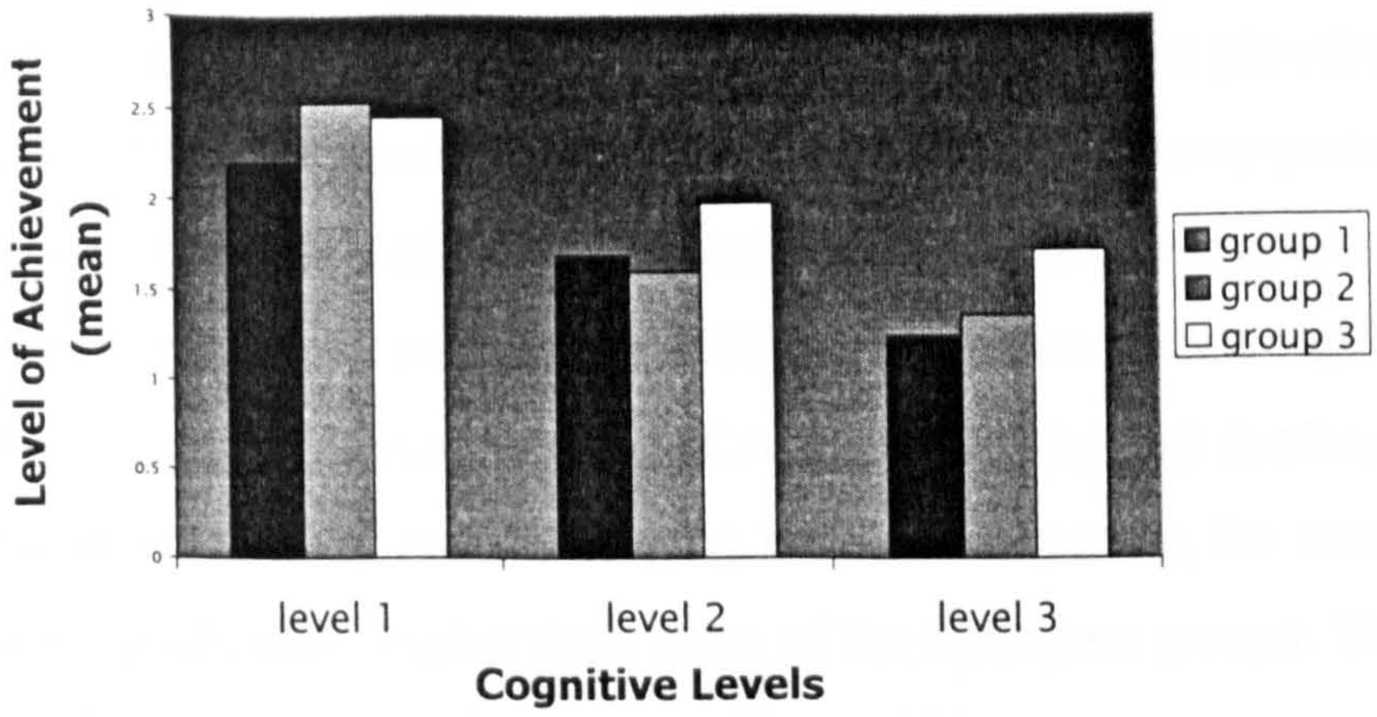

Figure 9: Pupil achievement by cognitive levels

The figures show that the MCA treatment does not have any significant effect on pupils' achievements on the lower cognitive and difficulty levels. It may therefore be concluded that for the lowest level questions, the CI guidance, which emphasised memorising, is more useful than the MCA treatment (as shown by ES values in Tables 12, 13, and 20). This research however did not make any attempt to prove such an assumption. On higher level questions, the findings show conclusively that the metacognitive awareness guidance effects pupils' performance and achievement.

The third key finding attested to the fact that Metacognitive Awareness Guidance (MCAG) not only improved pupils' achievements on specific reading tasks, but also increased their awareness of metacognitive reading strategies. They remembered and reported on having utilised these on the metacognitive strategy index questionnaire (MSIQ) on which the pupils of the MCA treatment group reported a higher level of metacognitive awareness (Hypothesis 2, Table 16). This finding becomes significant when analysing the complete picture which emerges from pupils' scores on the MSI questionnaire:

Subjects in all three research groups exhibited a low level of awareness of metacognitive reading strategies. Of a possible score of 17 (one point for each question answered correctly) the mean score of control group 1 is 7.25, of the CI placebo group is 7.71, and of the MCA treatment group is 9.14 (Table 18). Part two (MSIQ-D - during reading) consists of 6 questions. The mean score of the control group is 2.48,

that of the CI placebo group is 2.60 and that of the MCA treatment group is 2.66. The same low achievement is found on part three (MSIQ-A - after reading) which consists of 4 questions. The mean score of the control group is 1.81, that of the placebo group is 1.96 and that of the MCA treatment group is 1.94. Basically, a gloomy picture is revealed, with none of the groups achieving a 'passing' score on these sections. However, examining the different parts of the MSI questionnaire reveals significant differences. On those sections relevant to the MCA treatment - MSI-B (before reading) and MSI-BCD (building, creating and developing relevant schemata), the results of the treatment group are significantly higher than those of the other two groups. This difference is also reflected in the total score (see Figure 10).

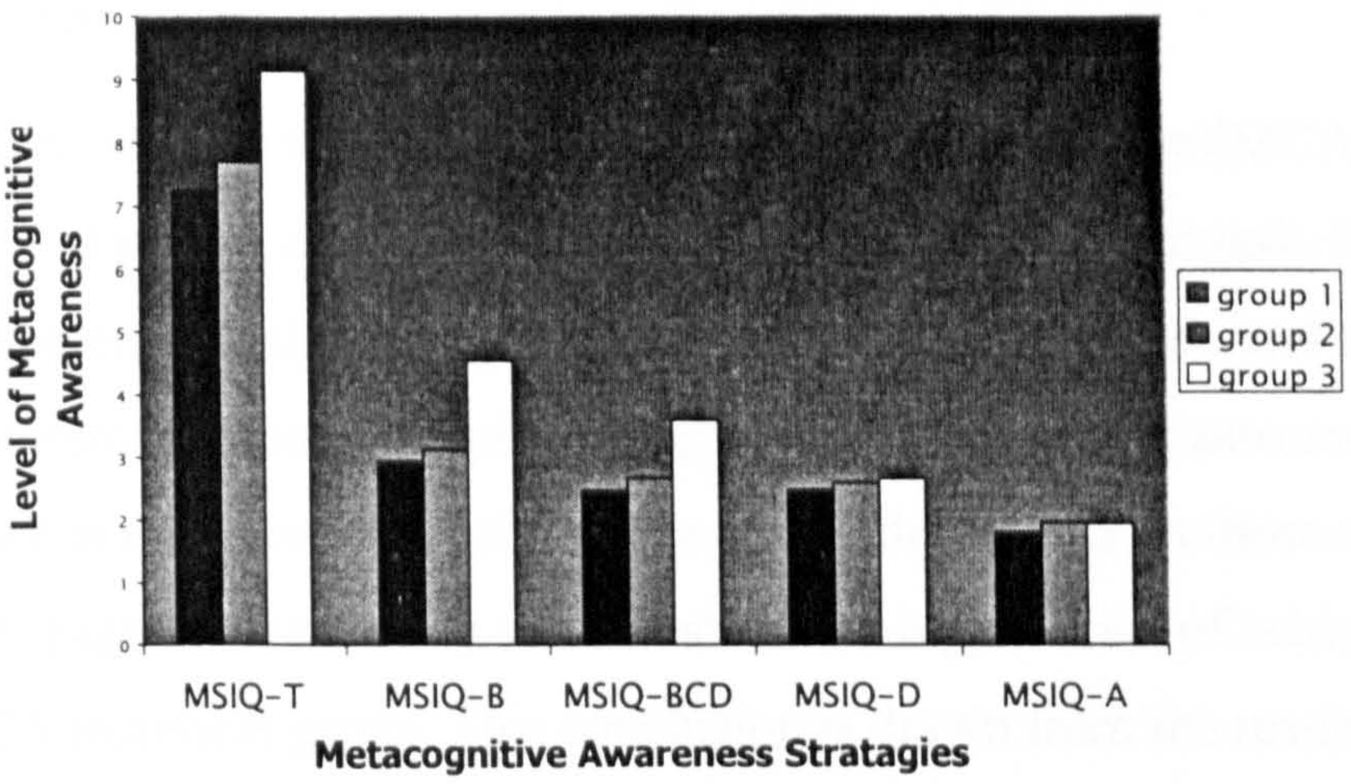

Figure 10: Pupil achievement on the MSI questionnaire

The ES values (MSIQ-T=0.62, MSIQ-B=0.92, MSIQ-BCD=0.64 - Tables 18, 20) establish the correlation between achievements and MCA treatment.

The fourth key finding indicates that teachers do not have the theoretical background needed to thoughtfully implement metacognitive learning principles. They have a superficial familiarity with the terms and with some of the strategies. Because they have the impression that metacognitive theory is a 'hot' issue in education today, they implement some of the strategies in their teaching. The lack of a theoretical framework causes them to make use of metacognitive strategies as a goal in itself rather than as strategies for improving learning. They want their pupils to experience the metacognitive strategies, but use them as tools for teaching facts and concepts, for

creating 'advanced organisers', or to increase pupils' interest and motivation. They do not use metacognitive reading strategies to regulate, monitor, and manage the pupils' process of understanding and constructing knowledge from text. They are actually in a difficult situation where, on one hand, they intuitively understand that they should utilise more "background stuff", while on the other hand, seek the assurance that such a process is actually beneficial.

What emerges from the interviews with the teachers is that they are willing and interested to learn more and to gain theoretical support for integrating metacognitive learning principles into their teaching methods. None of them dismissed the research as being unimportant or irrelevant. The language that teachers used, and their generally positive attitude to the study, gave me the feeling that they are sincere when they say that they want to learn more.

The fifth key finding implies that Metacognitive Awareness Guidance (MCAG) increased the level of pupils' engagement with the reading assessment task. Pupils' engagement here refers to making the pupils more actively involved in, and committed to the reading assessment process. Pupils' engagement in the reading assessment task makes a difference in their level of performance and achievements on those tasks. Pupils' level of engagement is the key to understand the higher level of achievement of pupils of the MCA treatment group. This conclusion is drawn from the results of four different research hypotheses. Although this conclusion is circumstantial in nature, it cannot be ignored.

(One) Engaging the learners in Metacognitive Awareness Guidance affects their performance on assessment tasks – they attain a higher level of achievement on these tasks (Hypothesis 1).

(Two) Learners' achievements on assessment tasks are significantly and positively correlated with their level of achievement on the MCAG (Hypothesis 5).

(Three)Learners who engaged in metacognitive awareness guidance demonstrated a significantly higher level of awareness of metacognitive reading strategies (MSI-Q Hypothesis 2).

(Four) No significant correlation was identified between subjects' level of achievement on MCAG and their level of awareness of metacognitive reading strategies (Hypothesis 7).

This unexpected and seemingly contradictory finding led me to look more deeply into the MCAG questions to find an explanation for their effect. I was aware that, in general, the pupils' responses to the MCAG questions were very disappointing, and that only a small number of students furnished satisfactory answers to the MCAG questions (Additional observations, Tables 24, 25 and 25). Furthermore, no correlation was identified between subjects' level of achievement on the MCAG and their level of awareness according to the MSI questionnaire. The conclusion from these two observations is that it is not necessarily students' achievement on the MCAG that made the difference in their level of achievement on the reading tasks or on their level of awareness according to the MSI questionnaire.

What seems to be significant is the role of the MCAG in creating engagement between the pupils and the reading process. From the theoretical basis, the principles and methods of implementation of the MCAG as described in Chapter 2 above, and as summarised in Tables 5a, 5b, and 5c, we see that the pupils were guided to construct their own responses, to use context information, to focus on what they already know and understand, to express their opinions, to anticipate, to raise questions, to suggest possible answers, to use direct explicit self-talk, and to reflect on what they know and how they can use it. Summarising these activities, we can say that the MCAG created commitment, involvement, connection, obligation and responsibility. It weakened the detachment between the task and the pupil. Their engagement with the task is the key to their higher level of achievement. The MCA seems to act as a trigger to involvement and commitment to the process of reading. Even when pupils do not exhibit a high level of activating prior knowledge, their involvement with the process of activating, creating, and discovering prior knowledge seems to make the difference. The role of engagement in learning is described by one of the teachers interviewed:

> *Because these kinds of questions don't have only one correct answer, all the pupils want to read their answers.... If I don't let pupils present, they* ***are hurt and offended****. Because for some reason* ***they are more attached*** *to that kind of homework assignment* (Appendix X-2).

Limitations and Future Directions

This research is analytical in nature. It mainly assumes that discrete elements of complex educational phenomena can be isolated for study, leaving all else unchanged. It is designed to test theory-based hypotheses driven by three main cognitive theories - metacognitive awareness theory, schema theory and the Vygotskian 'zone of proximal development'.

Stemming from this theoretical background, a controlled experiment served to test the general hypothesis that integration of metacognitive instruction within reading assessment tasks can enhance pupils achievement and facilitate better text comprehension. A functional link between the 'treatment' and pupil achievement is identified and validity is obtained within the analytic approach paradigm. The research offers both quantitative and qualitative data to support the hypothesis: a promising positive potential link between assessment tasks that incorporate metacognitive learning principles to pupil achievement is established.

But this research could not tell us whether such would be the case under normal classroom conditions nor what would happen if MCAG principles were integrated into the assessment of different subjects such as math or social studies. Furthermore, it does not consider other school- or classroom-related elements that may effect the findings. This limitation points to the need for research that examines this promising positive linkage using a systematic approach, one which considers the entire school-classroom setting, the whole dynamic ecology, the elements of which can not be easily (or usefully) separated.

We need systematic research that addresses the role of teachers in the new assessment tasks. Accepting the notion that teachers are the key to assessing pupils' academic achievements, and adopting the research implication that the theoretical framework needs to be incorporated into teacher education and professional development, the issue of supporting curricular and assessment materials that incorporate MCAG still needs to be addressed. Furthermore, the type of assessment tasks and the assessment process influence, in a fundamental way, the context in which these occur and visa-versa. Systematic research is therefore required to examine the effects and relationships between different assessment tasks in the class- and the whole school-

setting. Such research needs to analyse elements such as school and classroom norms, teacher-pupil-parent-principal relationships, teaching styles, social interaction, attitudes, abilities, and learning activities which are interdependent and inseparable. They even define one another in a transactional manner: change in one of them may change everything else and thus require the study of patterns rather than single variables.

Clearly, no good understanding of how metacognitive learning principles incorporated into assessment tasks effected pupil achievement could have been attained in the absence of this analytic research. Understanding how this can be woven into the complex web of classroom curricula and activities and into the whole school assessment array demands systematic research.

Because the two research paradigms address different issues and yield different kinds of knowledge, they should be seen as complementing and enriching one another rather than competing for truth. Therefore, this discussion recommends broadening the scope and implications of the research by conducting future research using the systematic approach.

The utilisation of the MCAG standard for evaluation still has to be closely examined, elaborated and extensively negotiated among teachers, educators, assessment experts and researchers to avoid future disagreement and disappointment and to ensure adequate presentation of performance. Questions still remain: How and what to grade? Should there be a rating scale and, if so, how can rubrics be made sensitive enough to embrace the variety and diversity of pupils' responses? Maybe the MCAG would be better assessed using new and different assessment methods such as interview, small group discussion, peer- or self-assessment. This range of issues needs to be carefully and sensitively addressed.

Although this research explicitly and repeatedly stated that the grade is not an issue, the question of grading the MCAG questions came up frequently. The teachers told the pupils that they would get a grade on the questions they answered before the task and they would have some weight in determining the final grade for the task:

> *One of the questions that recurred while my pupils were performing the three tasks was whether they would receive a grade on the metacognitive guidance as well as on the assessment task. This concerned them a great deal, especially the better pupils, possibly because they had to write more. Each time they received a task, at least 5 pupils asked again* (Appendix X-1)

This same dilemma was sensitively described by the teacher who incorporated MCAG questions into a history test:

> *Another thing I did was to announce that for the guiding questions, they would get 30 points, and on the test, 70 points - that was my way of telling them that it was important, and that's how I could know it was important to them....But I have a problem with grading the guidance questions. I have no doubt that their knowledge and their answers on the guidance affects their performance on the test, and what happens is that when I find that pupils who got only 10 out of 30 points on the guidance, and 30 out of 70 points on the test, I have a hard time deciding what to do about their final grade. Because if they lacked the context and the knowledge which others had, they received a lower grade. Is that fair?* (Appendix X-1)

Finally, I would like to address the findings pertaining to pupils' self-reported mental effort expenditure (ME) and importance and effectiveness (IE). These two research variables require further elaboration.

Research hypothesis 3 assumed that learners who receive written Metacognitive Awareness Guidance in addition to their assessment task (learners of the MCA treatment group 3) would report a higher level of mental effort. In contradiction to the assumption, pupils who in addition to the reading assessment tasks received Content Instruction (CI), and read the text before (subjects of placebo group 2), systematically reported on a higher level of mental effort expenditure while processing the reading assessment tasks.

The CI treatment caused the pupils to invest more effort in memorising details and facts from the text. However, the mental effort was not translated into a high level of cognitive achievement, but into a trivial learning activity – memorisation. This was not what the ME questionnaire was meant to identify. Even though the questionnaire introduced the pupils to the idea of mental effort and illustrated the idea using two concrete examples: tying one's shoes and struggling through a math problem, pupils misinterpreted the intent of the ME questionnaire, or had a different perception of what

represents mental effort. This may be because in the school context, studying is often considered by pupils to be equal to memorisation. Thus a memorisation task is viewed as one which requires considerable mental effort, in spite of the fact that it results in high achievement only on a low cognitive level, when there is no demand for analysis or synthesis of material. On the other hand, when pupils are guided in metacognitive activity, like thinking of what they already know (prior knowledge), or presenting their opinion, this is not, in the school context, seen by pupils to be a difficult task. This raises doubts about pupils' understanding of an abstract term such as mental effort, and, consequently, about the accuracy of their self-reports. We can conclude that a more comprehensive view of the ME questions should be obtained through interviews and validated in a response dialogue, and that the comparison of mental effort involved in memorisation vs. MCAG questions needs to be further examined.

Research hypothesis 4, which assumed that learners who received written Metacognitive Awareness Guidance in addition to their assessment task would report a higher level of importance and effectiveness (IE) than learners who received the CI treatment and read the passage before, was not validated. The pupils were asked to report and assess the importance and effectiveness of the MCAG after one reading session, and the IE questionnaire actually did not show any kind of pattern or direction. This issue should therefore be approached in a different time frame and through a different method. Perhaps pupils need to be involved in the intervention for a longer period of time so as to be able to report on their perceptions of the importance and influence of the intervention. Furthermore, it is possible that a self-report questionnaire is not a suitable tool to assess this kind of data. To gain a deeper understanding of the influence and the effect of the MCAG, we may need to use more sensitive techniques such as interviews or a focus group.

Implications

The challenge of this research is to provide a theoretical framework that links assessment practice to learning theory (in contrast to the established link between learning theory and teaching). The findings presented in this research may serve as an important and significant step in this direction.

The research integrates four metacognitive principles of learning within three different assessment tasks taken from the Israeli Kits of Assessment Tasks (KATs). The integration of the metacognitive learning principles was implemented through Metacognitive Awareness Guidance (MCAG).

Driven by three learning theories - metacognitive awareness theory, schemata theory and the Vygotskian 'zone of proximal development', the MCAG addresses four main metacognitive learning **principles**. *Context Information* - putting topics, issues, and subjects of assessment tasks into context, and guiding learners to use context information, to read with purpose and anticipation. *Building, creating, or discovering (BCD) relevant schema* - focusing on what the learners already know and encouraging them to make connections between their prior knowledge and the new knowledge in the assessment task. *Activating the relevant schema* - by involving the pupils through anticipating, raising questions, suggesting possible answers, and extending thinking about the task or topic before "going to work on it". *Creating and raising metacognitive awareness* of their prior knowledge and its role and effect on their performance and outcomes - by employing direct explicit self-talk. Learners are asked to use self-talk to monitor their activities and to establish meaningful connections with their MCAG activities.

Findings showed that the integration of metacognitive principles within the reading assessment tasks significantly enhanced pupil achievement in reading, especially in answering questions on high cognitive and difficulty levels. These findings were supported by one of the teachers interviewed. She decided to incorporate MCAG in a history test (see appendix X-1). Her observations about the link that she identified between the MCAG and pupils' performance on the history test are valuable and substantial:

One of the most interesting things I discovered as a result of this experience was that the answers to the questions on the test were longer and more detailed, and more relevant to the subjects we studied. The pupils used the introductory questions that they answered in the guidance for explanations, reinforcement and as a basis for their answers on the test. For me this was fantastic because usually their answers are short and trite (Appendix X-1)

Both the qualitative and the quantitative results lay a path between learning theories and assessing pupils' performance and achievements and established a solid basis for broadening the integration of other metacognitive learning principles within assessment tasks and methods, and using them as an integral ingredient to enrich and improve pupils' performance and outcomes.

Other metacognitive learning principles - such as predicting outcomes, planning ahead, self-explaining, noting failures in comprehension, sustaining their own learning, using active experiences, reflecting on their understanding and determining for themselves if they understood - are fully discussed and elaborated in the theoretical framework in an attempt to delineate the role of the meta-reader. The research findings provide a solid evidential basis, legitimisation, and justification for incorporating metacognitive awareness learning principles into assessment tasks.

In accordance with the MCAG metacognitive learning principles, pupils of the MCA group were exposed to relevant activities. These activities included focusing on existing knowledge, raising problems and suggesting possible answers, making predictions, making judgements, constructing meaning (by focusing on prior knowledge) expressing their thoughts and knowledge in writing, and actively using words from the semantic field of the reading assessment texts. This kind of activity seems to break the thin line that separates learners from the assessment task and draws the learner into the task, as described by all the four teachers interviewed:

I heard a number of pupils arguing and discussing the guidance questions. I didn't hear any direct reference to the reading passages of the tasks, but I did to the guidance questions. Because for some reason they are more attached to that kind of homework assignment (Appendix X-1).

All the pupils want to read their answers.... If I don't let pupils present, they are hurt and offended (Appendix X-2).

After the first task, there were pupils who asked if they could do only the guidance and not do the task (Appendix X-3).

When we talked about the tasks from your research afterwards, the pupils remembered more questions from the guidance than from the tasks and that bothered me (Appendix X-4).

Pupils' engagement can be enhanced through MCAG that encourages pupils to take responsibility for their performance by employing "active monitoring and consequent regulation and orchestration" of cognitive process to achieve cognitive goals (Flavell 1976: 282). The term 'pupils' engagement', as used here, differs from motivation; it means active involvement in, and commitment to, the learning process. Encouraged by the pupils' reaction to the Metacognitive Awareness Guidance and by pupil achievement on the reading assessment tasks, we can conclude that when we incorporate pupils' prior knowledge (BCD) and their reflections on their own learning experience (self-talk) into the assessment task, it causes pupil engagement, influences their learning processes, and improves their performance and level of achievement on the specific task.

This research points to pupil engagement as one of the intrinsic factors that effects their performance and level of achievements, and calls for using the MCAG to raise learners' level of engagement in order to improve their performance and achievements.

Fourteen days after completing the three reading assessment sessions, learners in the three groups received the Metacognitive Strategy Index Questionnaire (MSIQ, see Measured Variables and Instruments, and Appendix I). The score on the MSIQ reflects the subjects' level of awareness of metacognitive reading strategies: the higher the score, the higher the level of awareness.

Results show that pupils that were involved in processing the assessment tasks that integrate Metacognitive Awareness Guidance (MCA treatment group 3) reported a significantly higher level of awareness on the Metacognitive Strategy Index questionnaire. Metacognitive Awareness Guidance (MCAG) not only improved the pupils' achievements on specific reading tasks, but also increased their awareness of metacognitive reading strategies. ***Incorporating MCAG into assessment tasks enabled***

pupils to benefit from the process and to raise their level of awareness of metacognitive learning strategies. Thus, assessment tasks that incorporate MCAG function as a tool in the learning process as well. The MCAG actually affords learners the opportunity to engage in higher order operations: to test their knowledge, discover new links, anticipate, raise questions and suggest possible answers. As such, the MCAG functions within the 'zone of proximal development', addresses the learner's potential level of development and leads to internalisation of the guidance. Thus, it not only facilitates pupils' learning and improves outcomes on specific assessment tasks, but also increases the likelihood that they will apply higher order operations to other learning situations.

The field of education seems never to be lacking innovative ideas on teaching strategies. In the past decade alone, the field has enthusiastically embraced critical thinking, multiple intelligences, learning styles, constructivist classrooms, whole language, cooperative learning, and myriad other pedagogical theories and techniques. Yet, despite the openness with which educators have generally approached educational innovation, the field is, paradoxically, consistently accused of stagnation and intransigence. Indeed, educators are often characterised as being conservative and unwilling to change.

The root of this apparent contradiction may lay in the absence of a conceptual framework. Teachers have knowledge of learning principles but they lack the conceptual framework that would allow them to apply these principles the "right" way and thus achieve the desired outcomes. Understanding the conceptual framework allows for greater 'transfer'; that is, it may allow teachers to apply the principles in new learning, teaching and assessing situations. But more importantly, it can empower teachers by providing them with tools for intelligent criticism of these learning principles. Without thoughtful consideration, based on theory, teachers either revert to the status quo or adopted the principles thoughtlessly. Teachers are the key – they are the classroom practitioners. ***Teachers need a solid and strong theoretical background. In the absence of such a foundation, and in the absence of supporting curricular materials, teachers are unlikely to significantly change their practice.***

Epilogue

Years ago, I was inspired by Hilda Taba's words "If you want students to think differently, you need to teach differently". For years I have been seeking ways to make each student's learning experience a personal journey, and looking for effective ways to individualise the learning environment for all students, by using a variety of teaching strategies and providing learning activities suited to different learning styles and multiple intelligences. My personal journey in this research led me to add another essential factor to Taba's equation: ***If you want students to think differently, you need to teach differently and you need to assess differently. We need to personalise assessment tasks, and incorporating the MCAG into assessment is one of the beneficial ways to do it.***

Iser (1978) argued that the process of reading is a dynamic one, to which readers bring personal experience and social and cognitive schemata, in which predictions, assumptions and inferences are constantly made, developed, challenged and negated. If our goal is that pupils construct meaning for themselves in their reading, we have to acknowledge the concept of meaning and the role of the reader in determining meaning. We need assessment tasks that recognise the importance of the individual and that attempt to capture the authenticity of the learner's reading processes and outcomes. One of the teachers related to this issue:

> *But then, a **problem** arises because this kind of questions don't have only one correct answer.... You must have had the same **problem** when you checked the answers to the questions you gave before the tasks, because the answers can be very different and varied* (Appendix X-2).

In contrast to her perspective, the real challenge of assessment practice is first to acknowledge the central, active and privileged role of the learner in making meaning, and second, to acknowledge that meaning is dynamic and fluid, socially and culturally located. These beliefs should be viewed **as a challenge and a goal rather than as a problem.**

Finally, I would like to suggest that the discussion above be viewed not as a set of answers, but as a basis for debate among teachers, principals, parents, scholars of literacy, pedagogical experts and other researchers about the kind of assessment that

will benefit our pupils most, the kind of assessment to which our pupils are entitled. Valid assessment is, in my opinion, marked by its relevance to and usefulness in instruction for the benefit of our pupils. It should be viewed as part of the teaching process and not merely as its inevitable end point.

This research emanates from my personal ideas and years of practice as much as from theory and research. It is a fusion of

- ***A child centred*** view of teaching and assessment that acknowledges the importance of the individual and views every pupil as unique and special.
- ***A constructivist view*** of knowing and meaning-making that acknowledges the notion of meaning in text and places a different interpretation on the privileged role of the reader in determining meaning. In learning which occurs as students give meaning to experiences in light of their existing knowledge, assessment techniques should allow students to express their personal understanding of concepts in ways that are uniquely theirs.
- ***The Vygoyskian 'zone of proximal development'*** which suggests that assessment methods must take into account that what children can do on their own is their level of actual development, and what they can do with help is their level of potential development. Assessment methods must target both.
- ***Metacognitive learning theory*** that focuses on (a) the role of awareness and management of one's thinking, (b) individual differences in self-appraisal and mastery of cognitive development and learning, (c) knowledge and monitoring abilities that develop through experience, and (d) constructive and strategic thinking (Paris & Winograd 1990). Thus, the promise of metacognitive theory is that it focuses precisely on those characteristics of cognition that can contribute to pupils' awareness and understanding of being masters of their own thinking.
- ***Post-modern assessment*** or what Harrison, Bailey and Dewar (1998a) call 'responsive assessment' relates to teachers and learners as subjects rather than objects of the assessment process. They suggest using a wide range of methods and approaches to assess achievement, and actively involving pupils in negotiating and determining what serves as evidence of their learning. They

acknowledge the importance of the readers' role in determining meaning and state that assessment tasks should capture the authenticity of the reader's active response through interview and small group discussion to ensure the reader's central, powerful role as an active and purposeful user of text and creator of meaning (Harrison et al.1998a, 1998b).

This study is located at the intersection of three very significant paths of development: development in learning and reading theory and practice, development of new understanding of and goals for assessment of student achievement, and the involvement of the Israeli Ministry of Education in the reform of educational assessment by developing and promoting Kits of Assessment Tasks (KATs). I examined these three paths of development in an attempt to narrow the gaps between them. I integrated new knowledge of learning and reading theory into practice by adding written metacognitive awareness guidance to the Kits of Assessment Tasks.

Reading is the most fundamental skill needed in learning, and literacy assessment is one of the most important issues in literacy education today. The findings of this research, its results and implications, raise suggestions regarding "what ought to be" that will hopefully influence policy formation and contribute to the new assessment era in Israel's educational system. But more important, the research provides evidence relating to "how to do it". It thus has the potential value to improve teaching, learning and assessment, and to make a difference in the evaluation of pupils' reading performance.

List of Abbreviations

CI	Content instructions and the text of the assessment task. Treatment given to placebo group 2.
CI-1	Content Instructions for reading assessment task 1 (Appendix M).
CI-2	Content Instructions for reading assessment task 2 (Appendix N).
CI-3	Content Instructions for reading assessment task 3 (Appendix O).
MCA	Metacognitive awareness.
MCAG	Metacognitive Awareness Guidance. Written metacognitive awareness guidance - treatment given to treatment group 3.
MCAG-1	Written metacognitive awareness guidance for reading assessment task 1 (Appendix J).
MCAG-2	Written metacognitive awareness guidance for reading assessment task 2 (Appendix K).
MCAG-3	Written metacognitive awareness guidance for reading assessment task 3 (Appendix L).
ME	Five-item mental effort questionnaire given to all research subjects after processing the first assessment task (Appendix E).
IE	Six-item importance and effectiveness questionnaire given to subjects of CI treatment (Placebo) group2 and subjects of MCAG treatment (experimental) group 3, after processing the first assessment task (Appendices F, G).
MSIQ	17-item , 4-option, multiple choice Metacognitive Strategy Index questionnaire given to all research subjects two weeks after finishing the assessment tasks (Appendix I).
RAT	Reading assessment task, taken from the Israeli KATs collection (Appendices B, C, D)

Appendix A: Reading Test

The reading test on the following pages is a standard Israeli reading comprehension test (Lewy and Raz 1980). It was administered to the entire study population.

The test includes three short passages, each followed by a set of five questions (total - fifteen questions).

Group: _____

Name: _____ Gender: _____

School: _____ Class: _____

Reading Passages

Grade 4

There are three reading passages on these pages.

After each passages there are questions.

Each question has four answers but **only one answer is correct.**

Choose the correct answer and circle the number next to it,

Remember:

- Read the first passage and answer the questions which follow it. Only then go on to the next passage and then to the one after it.
- Before answering the questions, read the whole passage carefully.

Good Luck !

Story A

One of the most interesting birds I have ever seen is the tailor-bird. It's a small bird which is olive-green in color and it doesn't look at all special, but it builds its nest in a very special way. The birds work in pairs. First they find a big leaf which suits their purpose. Then, with their beaks, the make holes all around the edge of the leaf. Then they thread the holes with blades of grass. One bird pushes the 'thread' from the back of the leaf, while the other bird, sitting in the nest, pushes the threaded grass out through another hole until the edges of the leaf are joined together and there is a sack hanging on the tree. In it, the female tailor bird lays her eggs.

1. What does the bird use instead of thread?
   - **a) grass**
   - b) string
   - c) a spider's thread
   - d) thorns

2. Tailor-birds are interesting because they:
   - a) are small and olive-green in color
   - b) live in pairs
   - **c) build their nest in a special way**
   - d) fly very fast

3. The tailor-bird got its name because it:
   - a) is a very small bird
   - b) looks very special
   - **c) knows how to sew**
   - d) has a beak like a needle

4. Tailor-birds build their nests:

a) from leaves

b) in a hole in the tree

c) in high grass

d) in a lining of grass

5. What did the writer intend?

a) to tell you something new

b) to tell you a story

c) to tell you his feelings

d) that you guess the end of the story

Story B

Once I watched a seal and her two twin cubs for an hour or two, and if I had time, I could have kept watching them for hours. The little round furry creatures crawled all over each other and suckled while their mother was napping. Then the mischievous pair started romping around their mother, petting her and tickling her face with their flippers and nipping her head and neck, frolicking around her and teasing her. She napped with one eye open watching her cubs, and every once in a while she raised her head to look at them and to howl. I couldn't say what the howl meant, except perhaps a statement of satisfaction. Just as the cow licks her calf, every once in a while the mother seal hugged her cubs, sniffed and nipped at them, because seals have short tongues.

6. The mother seal guarded her cubs while she rested by:
   a) raising her head
   b) napping with one eye open
   c) hugging them lovingly
   d) nursing them

7. The writer calls the cubs "mischievous" because they:
   a) didn't want to sleep
   b) loved to tease their mother
   c) crawled all over each other
   d) were little

8. The writer explains that it is hard for the mother seal to lick her cubs because:
   a) they don't lie quietly
   b) she has a short tongue
   c) she falls asleep
   d) they tickle her face

9. In the writer's opinion, watching the seals was very:

a) enjoyable

b) useful

c) difficult

d) interesting

10. The writer talks about the cubs and their mother as if:

a) he had never seen them

b) they were not alive

c) they were like people

d) they were trouble-makers

Story C

The sundew is a small and pretty plant which grows in humid areas and in swamps. Its leaves grow in clusters on slender reddish stems. On each leaf are lovely sparkling drops that look like dew drops. An insect passing by thinks that the drops are sweet nectar and he is drawn to it and sits on the leaf. What a surprise! The sticky drops aren't dew – they are the glue the sundew uses to trap insects. The little leaves close on the insect, and he quickly disappears, because the sundew is one of the strange plants that eats live insects.

11. Insects are especially drawn to the sundew when they want to:

a) play
b) hide
c) rest
d) eat

12. An insect which sits down on the sundew disappears in the:

a) sun
b) sky
c) leaf
d) swamp

13. When an insect which sits down on the sundew disappears, he:

a) is eaten
b) is a flower
c) is asleep
d) fell on the ground

14. Where would you expect to find a sundew? In a place which is:

a) cold
b) wet
c) high
d) full of plants

15. The leaves of the sundew:

a) are slender

b) are shiny

c) grow in clusters

d) are covered with dew

Appendix B: Assessment Task 1 - "How is Paper Made"

Assessment Task 1 was administered to the whole study population.

- **Group 1 (control group) performed the task "as is".**
- **Group 2 (placebo group) was given Content Instructions (CI) and asked to read the text before performing the task..**
- **Group 3 (experimental group) was given Metacognitive Awareness Guidance (MCAG) before performing the task.**

Research Group: _____

Name: _____ Gender: _____

School: _____ Class: _____

How is Paper Made?

Hello children!

A. Do you know what paper is made of, and how it is manufactured?

Write what you know:

The passage you are going to read this time is about paper and how it is manufactured. It is a short passage, but it will tell you about many things. And another thing: it has a few "hard" words. You will be asked to read the passage several times, and each time to do a different activity.

Read the passage and underline the hard words.

In every house, there is paper: books, notebooks and letters, bills to be paid, wrapping paper and newspapers. We hoped that the computer would save us paper, but printers continue to use whole piles of paper.

In the ancient world, people already needed to write things down, and the ancient Egyptians used papyrus. In ancient China, people cooked fibers, rags and plants that they soaked in water. They pressed this "porridge" onto a big strainer where the thin layer dried and became paper. This secret reached Europe only 800 years ago.

When the printing press was invented, more paper was needed, and people produced paper from trees. Trees play an important role in protecting the environment. Cutting down so many trees has led to a big reduction in the number of trees in the world. This is dangerous to man, animals and plants.

To protect the trees which give the world the air we breathe, we have learned to recycle* * paper so that we can use it again. We should collect all the newspapers, notebooks, torn paper bags, notes and papers we don't need and throw them into special paper-collection containers.

These containers are taken to the "Amnir" factory, where they are torn up and "cooked" to manufacture new paper, just as good as before, almost the way it was done in ancient China.

(Written by Leora Ben Yehuda, and published in "Pilon", a news magazine for children)

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* recycle: to produce a new product from used materials

B. Preparing a dictionary *

Try to find an explanation of the words you didn't understand (you can ask your friend or your teacher, or use a dictionary).

Prepare a dictionary of definitions of words you didn't understand:

"Hard" word	Definition

C. Below are sentences from the passage. Answer the questions that relate to them.

1. **"We hoped that the computer would save us paper"** How?

2. **"In ancient China, people cooked fibers, rags and plants that they soaked in water"** Why did they do this?

3. **"They pressed this "porridge" onto a big strainer"** What porridge?

4. **"This secret reached Europe"** Which secret?

D. What we learned from the passage

1. What is the connection between producing paper and cutting down trees?

* If there are no dictionaries in the classroom, you can take the page home and fill in the definitions of the words you didn't know.

2. Why isn't it good to cut down a lot of trees?

_____

_____

_____

3. The passage suggests what to do with used paper. What is the suggestion?

_____

_____

_____

E. Below is a list of questions. The answers to some of them are in the passage. Circle the questions, which are answered in the passage.

1. How do you make a filter?
2. How do you make paper clothing?
3. How did the Chinese make paper?
4. How do you cook a tasty stew?
5. What is paper made of?

F. The title of the passage

Think of a good title for the passage and write it on the line above the passage on page 2. (You can decorate the letters and color them in, if you like.)

G. Your opinion about the passage

1. Do you think the passage is interesting? **Yes / No**
   Is it difficult? **Yes / No**

2. Do you think it is important to know the facts in the passage? Explain your answer.

_____

_____

_____

3. Did you learn things you didn't know before from the passage? If you did, what were they?

_____

_____

_____

Appendix C: Assessment Task 2 - "The End"

Assessment Task 2 was administered to the whole study population.

- **Group 1 (control group) performed the task "as is".**
- **Group 2 (placebo group) was given Content Instructions (CI) and asked to read the text before performing the task..**
- **Group 3 (experimental group) was given Metacognitive Awareness Guidance (MCAG) before performing the task.**

Note to Assessment Task 2 - "The End"

This exercise is based on two translations, one modern and one from the early 1950s, of A.A. Milne's poem The End (reproduced below). The translation of the questionnaire includes re-translations of the poem which deliberately emphasize the differences to which the questionnaire relates. The letters following each line indicate the rhyme scheme in the Hebrew translation.

"The End" by A.A. Milne from *Now we are Six*

When I was One,
I had just begun,

When I was Two,
I was nearly new.

When I was Three,
I was hardly me.

When I was Four,
I was not much more.

When I was Five,
I was just alive.

But now I am Six, I'm as clever as clever.
So I think I'll be six now for ever and ever.

Research Group: _____

Name: _____ Gender: _____

School: _____ Class: _____

The End

Below there are two translations of the same poem.

The poem was written in English by the poet and writer A.A. Milne (the name A.A. Milne may be familiar to you, because he is the author of "Winnie the Pooh", and the poems in "When We Were Very Young" and "Now We Are Six").

Begin with the first translation, by Yaakov Orland:

Translation A: **The End**	*rhyme scheme*
When I was one year old,	a
I was first born.	a
When I reached age two,	b
I was still "green".	b
Even at age three,	c
I was barely a person.	c
And only when I reached age four,	c
Did it fit me exactly.	c
When five years passed,	d
I began to catch on.	d
But now I am six, terribly clever and perfect,	e
So I think that I'll stay like this - six years old forever.	e

Now read the second translation, by Ora Morag:

Translation B: **The End**	*rhyme scheme*
When I was a one-year-old baby,	a
I was peepee and kaka and sleep.	a
When I was a boy of two,	b
I was like nothing yet.	b
When I was a boy of three,	c
I was just a bother,	c
When I was four-and-a-quarter,	d
You could see what nature intended.	d
When I was a boy of five,	e
Sometimes I was smart and sometimes dumb.	e
But now I'm six and wow - am I smart - just perfectly smart.	f
So I think I'll stay six from now on.	f

A 1. Which translation do you like better - the first or the second?

2. Why? _____

B. Below, one next to the other, are the first stanzas of both translations. Read them.

Translation A **The End** by Yaakov Orland	**Translation B** **The End** by Ora Morag
When I was one year old, I was first born.	When I was a one-year-old baby, I was peepee and kaka and sleep.

B 1. Which translation is more pleasant to read?

_____

2. Why? _____

C. Now, read the last stanza of both translations.

Translation A

But now I am six, terribly clever and perfect,
So I think that I'll stay like this - six years old forever.

Translation B

But now I'm six and wow - am I smart - just perfectly smart.
So I think I'll stay six from now on.

C 1. Which expressions in the two stanzas are "every day" expressions?
In translation A: _____
In translation B: _____

2. Which expressions in the two stanzas are written in "literary" language?
In translation A: _____
In translation B: _____

D. In both poems, the speaker is a six-year old child who is looking "back" on the years that have already passed.

What do you think? In which poem are the child's memories more pleasant? Why? Wait! Don't start writing right away. It's better to go back and reread the poems and think a little before starting to write.

In my opinion, the translation by _____ describes more pleasant memories because

_____

E. Why, in your opinion, does the boy in the poem think that it's a good idea for him to stay six years old forever?

_____

F. Why is the poem called "The End"?

_____

_____

G. 1. After you've read both poems again, have you changed your mind about the question "Which translation is better"? Yes / No

2. If your answer was "Yes" - Why did you change your mind?

_____

H. Here you can write a poem or a story which describes how you grew up and changed over the years.

_____

_____

_____

_____

_____

_____

_____

_____

Appendix D: Assessment Task 3 - "We Dream"

Assessment Task 3 was administered to the whole study population.

- **Group 1 (control group) performed the task "as is".**
- **Group 2 (placebo group) was given Content Instructions (CI) and asked to read the text before performing the task.**
- **Group 3 (experimental group) was given Metacognitive Awareness Guidance (MCAG) before performing the task.**

Research Group: _____

Name: _____ Gender: _____

School: _____ Class: _____

We Dream

We dream every night, but we don't always remember our dreams in the morning when we wake up. Usually we have a number of dreams every night. This was found by scientists in experiments they performed. They learned that rapid eye movements indicate that a person is dreaming. From observing the eye movements of people who are sleeping, scientists learned that people dream an average of four to six dreams a night. The length of the dream differs from one dream to another. The first dream lasts about ten minutes. The next dreams are longer. Women dream more than men, and children dream more than adults. Most people dream in black and white. Only a few dream in color.

There are many kinds of dreams. Some dreams make you happy, some make you laugh or giggle in your sleep, and some are sad. A very scary dream is called a nightmare. If you have had a nightmare, you should remember that a dream is only a dream, and that the frightening things you saw in your dream are not real.

(From *My Body and I* by J. Kaufman, p. 63, translated by Y. Kashti, in the series "Telling Pictures", published by Yavne, Tel Aviv)

A. Look for the answers to the following questions in the passage

1. How do we know when someone is dreaming?

_____

_____

_____

2. How many dreams does a person dream in one night?

_____

3. How long does the first dream last?

_____

B. How did scientists discover how many dreams a person dreams in one night?.

_____

_____

C. What is a nightmare?

_____

_____

D. 1. Did you find anything in the passage that surprised you?

Check: Yes _____ No _____

2. If your answer was yes, write what surprised you.

_____

_____

E. Are there other things that you would like to know about dreams, and were **not explained in the passage?**

If there are, write what:

_____

_____

_____

_____

F. If you want to, you can write about or draw a picture of a dream.

_____

_____

_____

_____

Appendix E: Mental Effort Questionnaire

The Mental Effort (ME) questionnaire on the following pages was administered to Group 1 (control group) after they performed Assessment Task 1 (Appendix B).

The ME questionnaire has five questions.

Research Group: _____

Name: _____ Gender: _____

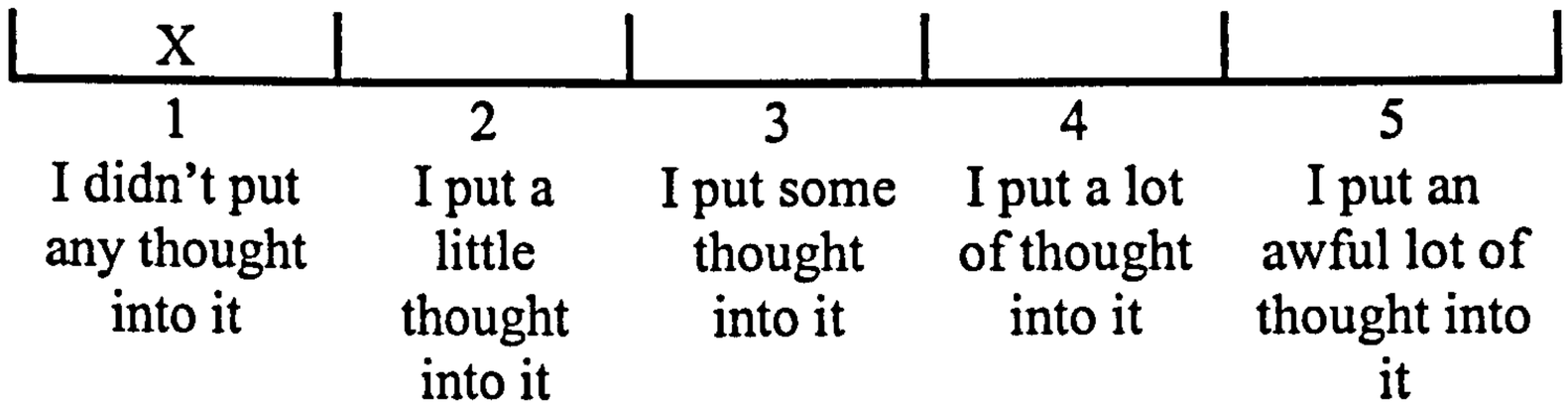
School: _____ Class: _____

ME Questionnaire

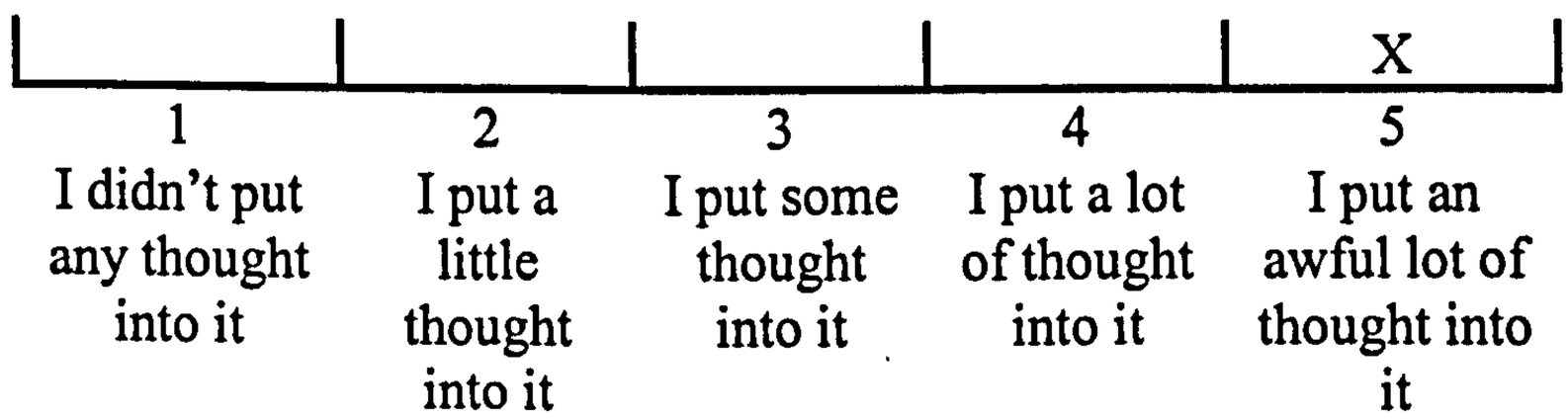
There are things we do in life that we don't have to think much about or to make a big effort to do. For example, we don't have to concentrate on putting on shoes. On the other hand, there are things that we do have to put a lot of thought into doing, for instance, solving a math problem.

Let's imagine that we have a scale with five steps. On one end, it says "I didn't put any thought into it" and on the other end, it says, "I put an awful lot of thought into it".

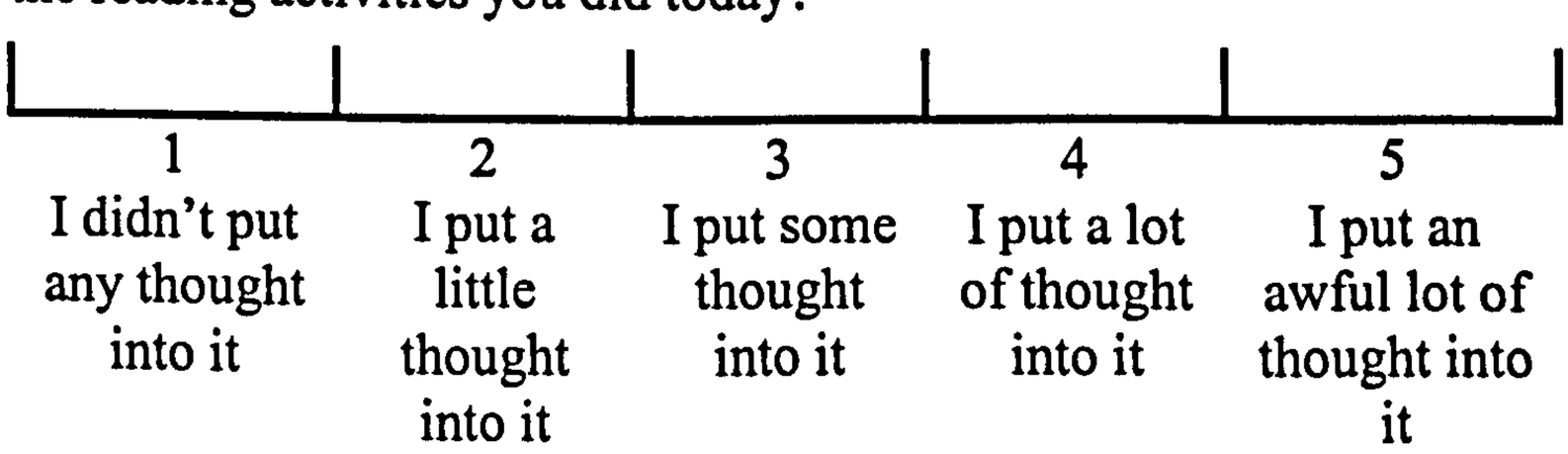
Probably "putting on my shoes" would get the grade of 1, and look like this:



But "solving a math problem" would get the grade of 4 or 5, and look like this:



1. Where on this scale would you put the amount of thought you put into the reading activities you did today?



2. When you put on a pair of shoes, you don't usually have to give yourself advice about how to do it. But when you solve a math problem, you usually ask yourself questions and think about what you are doing.

   To what extent did you think about what you were doing during the reading activity you did today?

1	2	3	4	5
I didn't think about what I was doing at all	I thought a little about what I was doing	I thought about what I was doing	I thought a lot about what I was doing	I thought an awful lot about what I was doing

3. To what extent did you concentrate while you were doing the reading activity today?

1	2	3	4	5
I didn't concentrate at all	I concentrated a little	I concentrated	I concentrated a lot	I concentrated an awful lot

4. To what extent was the reading activity you did today interesting?

1	2	3	4	5
not interesting at all	a little interesting	interesting	very interesting	extremely interesting

5. To what extent was the reading activity you did today different from other reading activities you have done in school?

1	2	3	4	5
not different at all	a little different	different	very different	extremely different

Appendix F: Mental Effort, Importance and Effectiveness Questionnaire (MEIE - CI)

The Mental Effort Importance and Effectiveness (MEIE-CI) Questionnaire on the following pages was given to Group 2 (placebo group) after they performed Assessment Task 1 (Appendix B).

The MEIE questionnaire has two parts.

- **Part I, questions 1 - 5, is the ME Questionnaire (Appendix E).**
- **Part 2, questions 6 - 11 are complementary questions.**

Research Group: _____

Name: _____ Gender: _____

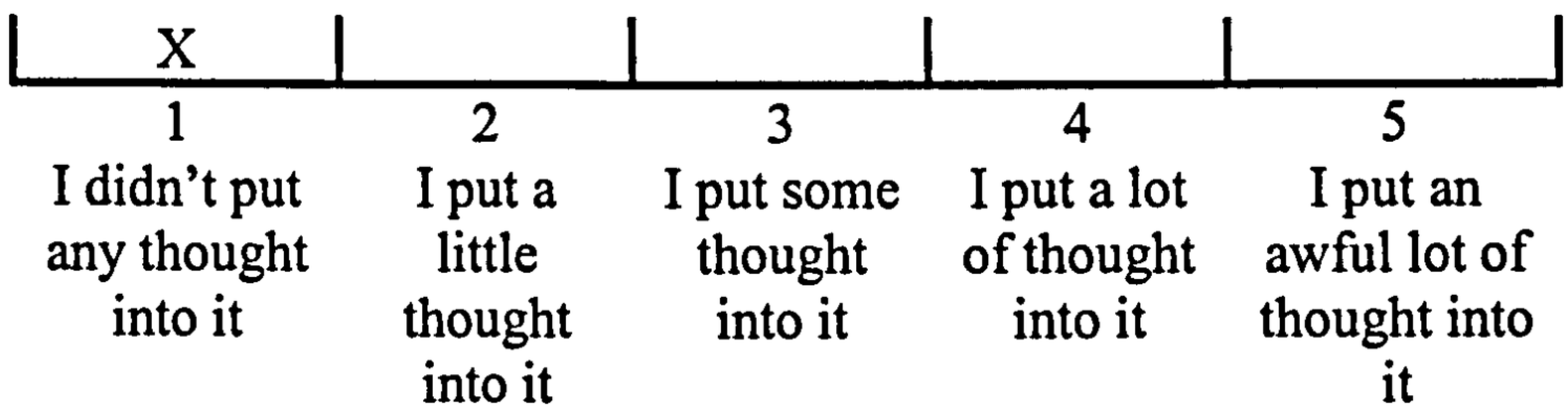
School: _____ Class: _____

MEIE Questionnaire

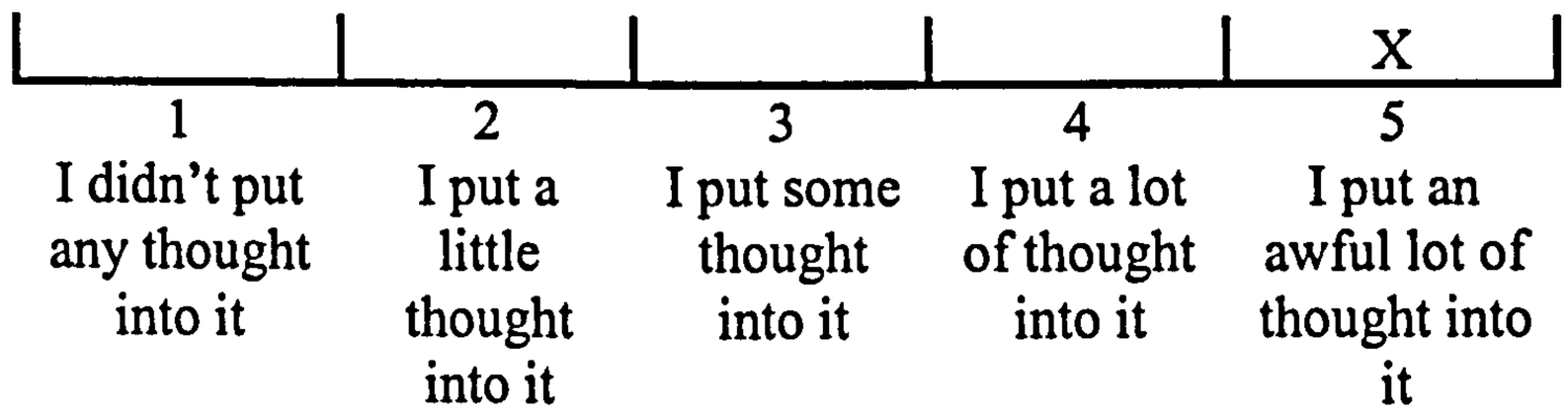
There are things we do in life that we don't have to think much about or to make a big effort to do. For example, we don't have to concentrate on putting on shoes. On the other hand, there are things that we do have to put a lot of thought into doing, for instance, solving a math problem.

Let's imagine that we have a scale with five steps. On one end, it says "I didn't put any thought into it" and on the other end, it says, "I put an awful lot of thought into it".

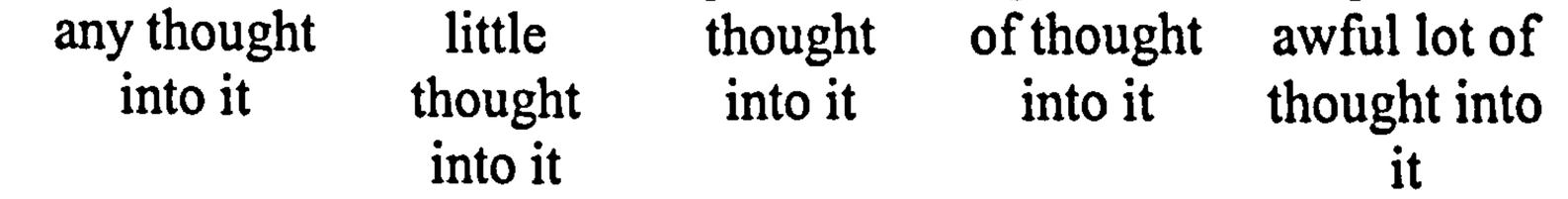
Probably "putting on my shoes" would get the grade of 1, and look like this:



But "solving a math problem" would get the grade of 4 or 5, and look like this:



1. Where on this scale would you put the amount of thought you put into the reading activities you did today?



2. When you put on a pair of shoes, you don't usually have to give yourself advice about how to do it. But when you solve a math problem, you usually ask yourself questions and think about what you are doing.

   To what extent did you think about what you were doing during the reading activity you did today?

1	2	3	4	5
I didn't think about what I was doing at all	I thought a little about what I was doing	I thought about what I was doing	I thought a lot about what I was doing	I thought an awful lot about what I was doing

3. To what extent did you concentrate while you were doing the reading activity today?

1	2	3	4	5
I didn't concentrate at all	I concentrated a little	I concentrated	I concentrated a lot	I concentrated an awful lot

4. To what extent was the reading activity you did today interesting?

1	2	3	4	5
not interesting at all	a little interesting	interesting	very interesting	extremely interesting

5. To what extent was the reading activity you did today different from other reading activities you have done in school?

1	2	3	4	5
not different at all	a little different	different	very different	extremely different

Study Group 2

The reading activity you did in class today had two parts:

Part 1 - you read a passage and tried to understand it

Part 2 - you answered questions about the passage.

All the questions below are about Part 1 - reading the passage and trying to understand it.

Circle your answer:

6. To what extent did Part 1 of the reading activities help you understand the reading passage better?

   1. It helped me a lot
   2. It helped me a little
   3. It didn't help me at all
   4. It confused me

7. To what extent did Part 1 of the reading activities help you answer the questions?

   1. It helped me a lot
   2. It helped me a little
   3. It didn't help me at all
   4. It confused me

8. Do you think that Part 1 of the reading activities helped you give better answers to the questions?

   1. Yes
   2. No

9. Do you think that it's a good idea to read the passage before answering any question about it?

   1. Yes Why? _____
   2. No Why? _____

10. To what extent did Part 1 of the reading activities interest you?
    1. Very Interesting
    2. Interesting
    3. Not Interesting
    4. Boring

11. Would you like to get reading activities that have Part 1?
    1. Yes Why? _____
    2. No Why? _____

Appendix G: Mental Effort, Importance and Effectiveness Questionnaire (MEIE - MCAG)

The Mental Effort Importance and Efficiency (MEIE-MCAG) Questionnaire on the following pages was given to Group 3 (experimental group) after they performed Assessment Task 1 (Appendix B).

The MEIE questionnaire has two parts.

- **Part I, questions 1 - 5, is the ME Questionnaire (Appendix E).**
- **Part 2, questions 8 - 11 are complementary questions.**

Research Group: _____

Name: _____ Gender: _____

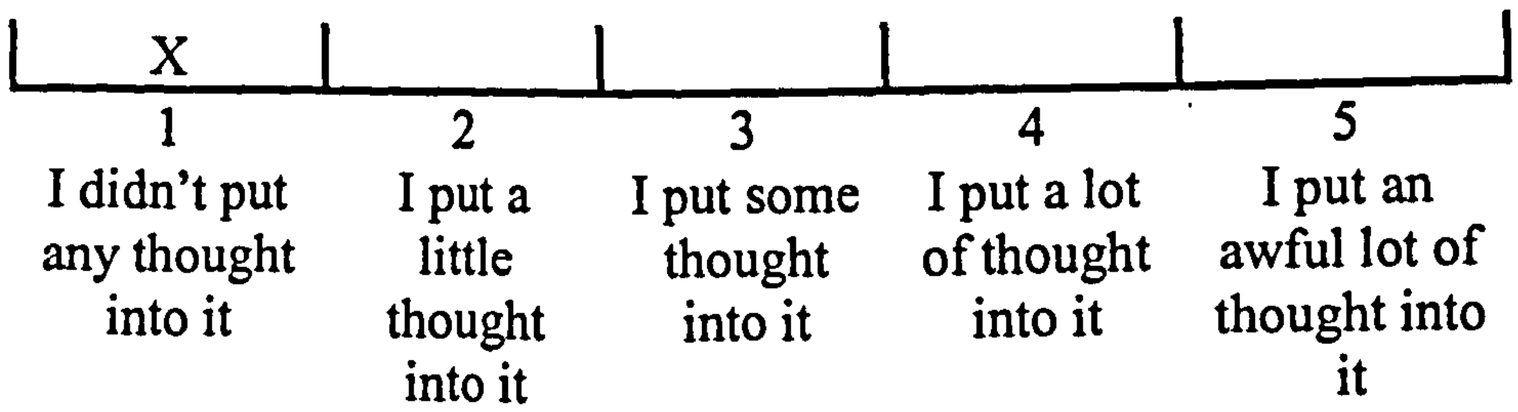
School: _____ Class: _____

MEIE Questionnaire

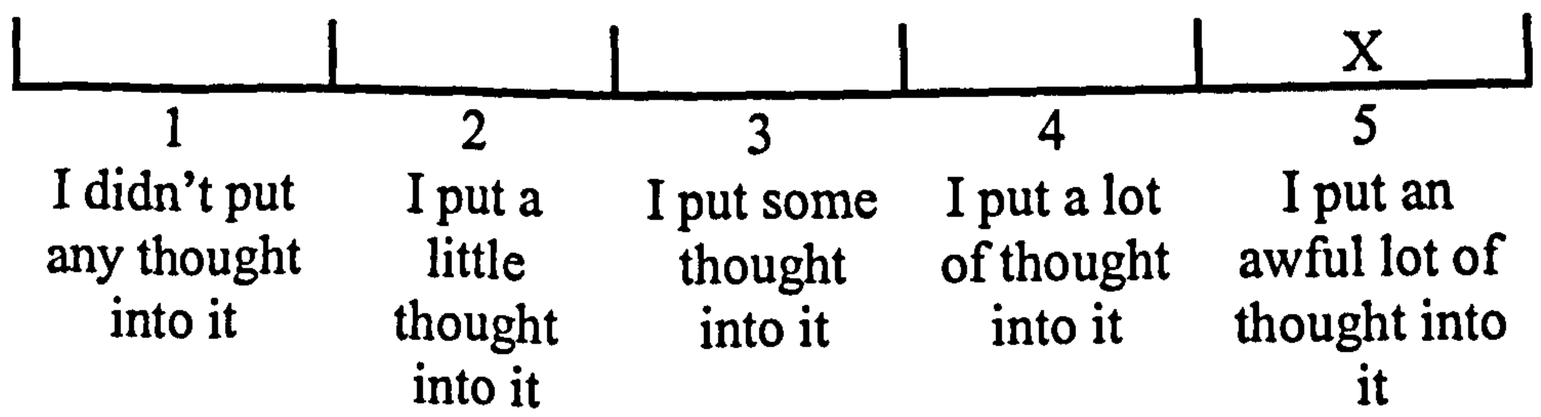
There are things we do in life that we don't have to think much about or to make a big effort to do. For example, we don't have to concentrate on putting on shoes. On the other hand, there are things that we do have to put a lot of thought into doing, for instance, solving a math problem.

Let's imagine that we have a scale with five steps. On one end, it says "I didn't put any thought into it" and on the other end, it says, "I put an awful lot of thought into it".

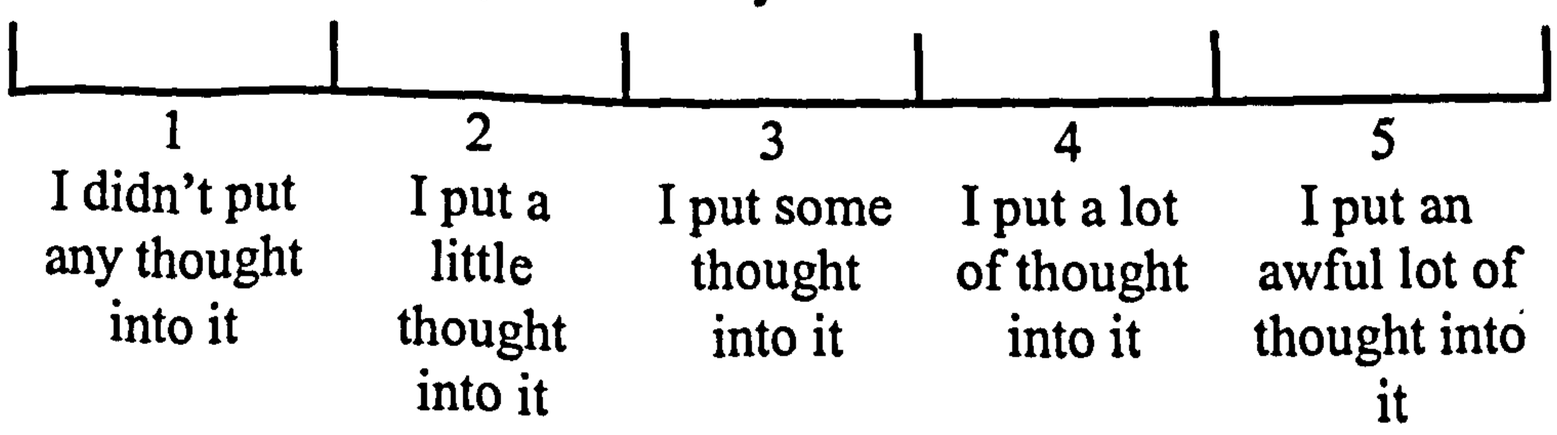
Probably "putting on my shoes" would get the grade of 1, and look like this:



But "solving a math problem" would get the grade of 4 or 5, and look like this:



1. Where on this scale would you put the amount of thought you put into the reading activities you did today?



2. When you put on a pair of shoes, you don't usually have to give yourself advice about how to do it. But when you solve a math

problem, you usually ask yourself questions and think about what you are doing.

To what extent did you think about what you were doing during the reading activity you did today?

1	2	3	4	5
I didn't think about what I was doing at all	I thought a little about what I was doing	I thought about what I was doing	I thought a lot about what I was doing	I thought an awful lot about what I was doing

3. To what extent did you concentrate while you were doing the reading activity today?

1	2	3	4	5
I didn't concentrate at all	I concentrated a little	I concentrated	I concentrated a lot	I concentrated an awful lot

4. To what extent was the reading activity you did today interesting?

1	2	3	4	5
not interesting at all	a little interesting	interesting	very interesting	extremely interesting

5. To what extent was the reading activity you did today different from other reading activities you have done in school?

1	2	3	4	5
not different at all	a little different	different	very different	extremely different

Study Group 3

The reading activity you did in class today had two parts:

Part 1 - you answered questions before you read the passage
Part 2 - you read the passage and then answered questions.

All the questions below are about Part 1: questions you answered before you read the passage.

Circle your answer:

6. To what extent did Part 1 of the reading activities help you understand the reading passage better?

    1. It helped me a lot
    2. It helped me a little
    3. It didn't help me at all
    4. It confused me

7. To what extent did Part 1 of the reading activities help you answer the questions?

    1. It helped me a lot
    2. It helped me a little
    3. It didn't help me at all
    4. It confused me

8. Do you think that Part 1 of the reading activities helped you give better answers to the questions?

    1. Yes
    2. No

9. Do you think that it's a good idea to answer questions before beginning to read a passage?

    1. Yes Why? _____
    2. No Why? _____

10. To what extent did Part 1 of the reading activities interest you?

    1. Very Interesting
    2. Interesting
    3. Not Interesting
    4. Boring

11. Would you like to get reading activities that have Part 1?

    1. Yes Why? _____
    2. No Why? _____

Appendix H: Metacognitive Strategy Index (MSI)

The MSI questionnaire on the following pages is a 25-item, 4-option, multiple-choice questionnaire that asks students about the metacognitive strategies they could use before (questions 1-10), during (questions 11-20), and after (questions 21-25) reading.

The questionnaire was developed by Maribeth Cassidy Schmitt (1990).

MSI Questionnaire

Directions: Think about what kinds of things you can do to help you understand a story better before, during, and after you read it. Read each of the lists of four statements and decide which of them would help *you* the most.

There are no right answers. It is just what *you* think would help the most. Circle the number of the statement you choose.

Part 1

In each set of four, choose the one statement which you think tells a good thing to do to help you understand a story better *before* you read it.

1. Before I begin reading, it's a good idea to:
    1. See how many pages are in the story
    2. Look up all of the big words in the dictionary
    3. **Make some guesses about what I think will happen in the story**
    4. Think about what has happened so far in the story
2. Before I begin reading, it's a good idea to:
    1. **Look at the pictures to see what the story is about**
    2. Decide how long it will take me to read the story
    3. Sound out the words I don't know
    4. Check to see if the story is making sense
3. Before I begin reading, it's a good idea to:
    1. Ask someone to read the story to me
    2. **Read the title to see what the story is about**
    3. Check to see if most of the words have long or short vowels in them
    4. Check to see if the pictures are in order and make sense
4. Before I begin reading, it's a good idea to:
    1. Check to see that no pages are missing
    2. Make a list of words I'm not sure about
    3. **Use the title and pictures to help me make guesses about what will happen in the story**
    4. Read the last sentence so I will know how the story ends.
5. Before I begin reading, it's a good idea to:
    1. **Decide why I am going to read the story**
    2. Use the difficult words to help me make guesses about what will happen in the story
    3. Reread some parts to see if I can figure out what is happening if things aren't making sense
    4. Ask for help with the difficult words

6. Before I begin reading, it's a good idea to:
    1. Retell all the main points that have happened so far
    2. **Ask myself questions that I would like to have answered in the story**
    3. Think about the meaning of the words, which have more than one meaning
    4. Look through the story to find all of the words with three or more syllables

7. Before I begin reading, it's a good idea to:
    1. Check to see if I have read this story before
    2. **Use my questions and guesses as a reason for reading the story**
    3. Make sure I can pronounce all of the words before I start
    4. Think of a better title for the story

8. Before I begin reading, it's a good idea to:
    1. Think of what I already know about the things I see in the pictures
    2. See how many pages are in the story
    3. **Choose the best part of the story to read again**
    4. Read the story aloud to someone

9. Before I begin reading, it's a good idea to:
    1. Practice reading the story aloud
    2. Retell all of the main points to make sure I can remember the story
    3. **Think of what the people in the story might be like**
    4. Decide if I have enough time to read the story

10. Before I begin reading, it's a good idea to:
    1. Check to see if I am understanding the story so far
    2. Check to see if the words have more than one meaning
    3. **Think about where the story might be taking place**
    4. List all of the important details

Part 2

In each set of four, choose the one statement which tells a good thing to do to help you understand a story better *while* you are reading it.

Circle your answer:

11. While I'm reading, it's a good idea to:
    1. Read the story very slowly so that I will not miss any important parts
    2. Read the title to see what the story is about
    3. Check to see if the pictures have anything missing
    4. **Check to see if the story makes sense by seeing if I can tell what's happened so far**

12. While I'm reading, it's a good idea to:
    1. **Stop to retell the main points to see if I am understanding what has happened so far**
    2. Read the story quickly so that I can find out what happened
    3. Read only the beginning and the end of the story to find out what it is about
    4. Skip the parts that are too difficult for me

13. While I'm reading, it's a good idea to:
    1. Look all of the big words up in the dictionary
    2. Put the book away and find another one if things aren't making sense
    3. **Keep thinking about the title and the pictures to help me decide what is going to happen next**
    4. Keep track of how many pages I have left to read

14. While I'm reading, it's a good idea to:
    1. Keep track of how long it is taking me to read the story
    2. **Check to see if I can answer any of the questions I asked before I started reading**
    3. Read the title to see what the story is going to be about
    4. Add the missing details to the pictures

15. While I'm reading, it's a good idea to:
    1. Have someone read the story aloud to me
    2. Keep track of how many pages I have read
    3. List the story's main characters
    4. **Check to see if my guesses are right or wrong**

16. While I'm reading, it's a good idea to:
    1. Check to see if the characters are real
    2. Make a lot of guesses about what is going to happen next
    3. Not look at the pictures because they might confuse me
    4. **Read the story aloud to someone**

17. While I'm reading, it's a good idea to:
    1. **Try to answer the questions I asked myself**
    2. Try not to confuse what I already know with what I'm reading about
    3. Read the story silently
    4. Check to see if I am saying the new vocabulary words correctly

18. While I'm reading, it's a good idea to:
    1. **Try to see if my guesses are going to be right or wrong**
    2. Reread to be sure I haven't missed any of the words
    3. Decide on why I am reading the story
    4. List what happen first, second, third, and so on

19. While I'm reading, it's a good idea to:
    1. See if I can recognize the new vocabulary words
    2. Be careful not to skip any parts of the story
    3. Check to see how many of the words I already know
    4. **Keep thinking of what I already know about the things and ideas in the story to help me decide what is going to happen**

20. While I'm reading, it's a good idea to:
    1. **Reread some parts or read ahead to see if I can figure out what is happening if things aren't making sense**
    2. Take my time reading so that I can be sure I understand what is happening
    3. Change the ending so that it makes sense
    4. Check to see if there are enough pictures to help make the story ideas clear

Part 3

In each set of four, choose the one statement which tells a good thing to do to help you understand a story better *after* you have read it.

21. After I've read a story, it's a good idea to:
    1. Count how many pages I read with no mistakes
    2. Check to see if there were enough pictures to go with the story to make it interesting
    3. **Check to see if I met my purpose for reading the story**
    4. Underline the causes and effects

22. After I've read a story, it's a good idea to:
    1. Underline the main idea
    2. **Retell the main points of the whole story so that I can check to see if I understood it**
    3. Read the story again to be sure I said all the words right
    4. Practice reading the story aloud

23. After I've read a story, it's a good idea to:
    1. Read the title and look over the story to see what it is about
    2. Check to see if I skipped any of the vocabulary words
    3. **Think about what made me make good or bad predictions**
    4. Make a guess about what will happen next in the story

24. After I've read a story, it's a good idea to:
    1. Look up all of the big words in the dictionary
    2. Read the best parts aloud
    3. Have someone read the story aloud to me
    4. **Think about how the story was like things that I already knew about before I started reading**

25. After I've read a story, it's a good idea to:

1. **Think about how I would have acted if I were the main character in the story**
2. Practice reading the story silently for practice of good reading
3. Look over the story title and pictures to see what will happen
4. Make a list of the things I understood the most

Appendix I: Metacognitive Strategy Index Questionnaire (MSIQ)

The MSIQ, as presented below, is a subset of the MSI questionnaire, which was especially customized for the subjects of the sample.

The MSIQ is composed of 17 items, 4 options, multiple choice questionnaire that asks students about the metacognitive strategy they can use before (questions 1 - 7; MSI-B), during (questions 8 - 13; MSI-D), and after (questions 14 - 17; MSI-A) reading.

The questionnaire was given to the whole study population.

Research Group: _____

Name: _____ Gender: _____

School: _____ Class: _____

Reading Questionnaire

Think about what kinds of things you can do to help you understand a story better

before,

during, and

after you read it.

Directions: Read each of the lists of the four statements and decide which one of them would help *you* the most - the **worthwhile** one

There are no right answers. It is just what *you* think would help the most. Circle the number of the statement you choose.

Part 1 - Before Reading

In each set of four, choose the one statement which, you think, will be worthwhile to help you understand a story better before you read it.

Circle your answer:

1. Before I begin reading, it's a good idea to:
    1. See how many pages are in the story
    2. Look up all of the big words in the dictionary
    3. **Make some guesses about what I think will happen in the story**
    4. Think about what has happen so far in the story
2. Before I begin reading, it's a good idea to
    1. Ask someone to read the story to me
    2. **Read the title to see what the story is about**
    3. Check to see if most of the words have long or short vowels in them
    4. Check to see if the pictures are in order and make sense
3. Before I begin reading, it's a good idea to
    1. Check to see that no pages are missing
    2. Make a list of words I'm not sure about
    3. **Use the title and pictures to help me guess what will happen in the story**
    4. Read the last sentence so I will know how the story ends.
4. Before I begin reading, it's a good idea to
    1. **Decide why I am going to read the story**
    2. Use the difficult words to help me guess what will happen in the story
    3. Reread some parts to see if I can figure out what is happening if things aren't making sense
    4. Ask for help with the difficult words
5. Before I begin reading, it's a good idea to
    1. Retell all the main points that have happened so far
    2. **Ask myself questions that I would like to have answered in the story**
    3. Think about the meaning of the words, which have more than one meaning
    4. Ask for help with the difficult words
6. Before I begin reading, it's a good idea to
    1. Check to see if I have read this story before
    2. **Use my questions and guesses reasons for reading the story**
    3. Make sure I can pronounce all of the words before I start
    4. Think of a better title for the story

7. Before I begin reading, it's a good idea to
    1. Check to see if I have understood the story so far
    2. Check to see if the words have more than one meaning
    3. **Think about where the story might be taking place**
    4. List all of the important details

Part 2 - During Reading

In each set of four, choose the one statement, which, you think, will be worthwhile to help you understand a story better *while* you are reading it

Circle your answer:

8. While I am reading, it's a good idea to:
    1. Read the story very slowly so that I will not miss any important parts
    2. Read the title to see what the story is about
    3. Check to see if the pictures have anything missing
    4. **Check to see if the story makes sense by seeing if I can tell what's happened so far**

9. While I am reading, it's a good idea to:
    1. **Stop to retell the main points to see if I understand what has happened so far**
    2. Read the story quickly so that I can find out what happened
    3. Read only the beginning and the end of the story to find out what it is about
    4. Skip the parts that are too difficult for me

10. While I am reading, it's a good idea to:
    1. Keep track of how long it is taking me to read the story
    2. **Check to see if I can answer any of the questions I asked before I started reading**
    3. Read the title to see what the story is going to be about
    4. Add the missing details to the picture

11. While I am reading, it's a good idea to:
    1. Check to see if the characters are real
    2. **Make a lot of guesses about what is going to happen next**
    3. Not look at the pictures because they may confuse me
    4. Read the story aloud to someone

12. While I am reading, it's a good idea to:
    1. **Try to see if my guesses are going to be right or wrong**
    2. Reread to be sure I haven't missed any of the words
    3. Decide on why I am reading the story
    4. List what happen first, second, third, and so on

13. While I am reading, it's a good idea to:
    1. See if I can recognize the new vocabulary words
    2. Be careful not to skip any parts of the story
    3. Check to see how many of the words I already know
    4. **Keep thinking of what I already know about the things and ideas in the story to help me decide what is going to happen**

Part 3 - After Reading

In each set of four, choose the one statement which, you think, will be worthwhile to help you understand a story better *after* you have read it.

Circle your answer:

14. After I've read a story, it's a good idea to:
    1. Count how many pages I read with no mistakes
    2. Check to see if there are enough pictures to go with the story to make it interesting
    3. **Check to see if I meet the purpose for reading the story**
    4. Underline the causes and effects

15. After I've read a story, it's a good idea to:
    1. Underline the main idea
    2. **Retell the main points of the whole story so that I can check to see if I understood it**
    3. Read the story again to be sure I said all the words right
    4. Practice reading the story aloud

16. After I've read a story, it's a good idea to:
    1. Lookup all of the big words in the dictionary
    2. Read the best parts aloud
    3. Have someone read the story aloud to me
    4. **Think about how the story was like things I already knew about before I started reading**

17. After I've read a story, it's a good idea to:
    1. **Think about how I would have acted if I were the main character in the story**
    2. Practice reading the story silently for practice of good reading
    3. Look over the story title and pictures to see what will happen
    4. Make a list of the things I understood the most

Appendix J: Metacognitive Awareness Guidance (MCAG - 1)

The Metacognitive Awareness Guidance on the following pages was administered only to Group 3 (experimental group) before they performed Assessment Task 1 (Appendix B).

Research Group: _____

Name: _____ Gender: _____

School: _____ Class: _____

The title of the passage you are about to read is **"How Paper is Made"**.

In the passage, the writer describes the following:

- How paper is made
- What problem arises during the process of manufacturing paper
- Solutions to the problem

Before reading the passage, please try to answer the following questions:

1. What do you think paper is made of? In my opinion, _____
   _____
2. What problem could there be when manufacturing paper? In my opinion,
   _____
3. What solution can you suggest to the problem that you raised? The solution, in my opinion, is _____
   _____

Write a short paragraph to fit the title **"How Paper is Made"**, using the following words: **paper, wood, manufacture, recycle**

_____

_____

_____

_____

Now, before asking your teacher for the learning task, please say these words aloud:

Now I know more about manufacturing paper.
This knowledge will help me to understand the passage.
Now it will be easier for me to study the passage.

Appendix K: Metacognitive Awareness Guidance (MCAG - 2)

The Metacognitive Awareness Guidance on the following pages was administered only to Group 3 (experimental group) before they performed Assessment Task 2 (Appendix C).

Research Group: _____

Name: _____ Gender: _____

School: _____ Class: _____

You are about to read two different translations of the poem **"The End"**.

The poem was written in English by **A. A. Milne,** writer of children's books and poems, and translated into Hebrew.

Yaacov Orland translated the poem in **1957.**

Ora Morag translated the poem in **1992.**

35 years passed between the first translation and the second one!!!

In your opinion, will there be a difference between the first translation and the second one? What is the difference? I think that _____

because _____

Yaacov Orland is 81 years old. He was born in Ukraine in 1914, and immigrated to Israel at the age of 7. He wrote and translated many songs, poems and plays. His style of writing has been described as "lyrical and melodious, with clear and neat rhymes".

Ora Morag is 50 years old. She was born in Haifa, Israel in 1943. For several years she was an actress. She has written and translated a number of books for children.

Her books have been described as "written in authentic children's language, with humor and free verse".

Do you think that these facts will influence the style of the translation?

Yes _____ No _____

Before reading the two translations, repeat to yourself:

The poem **"The End"** was written by _____. It was translated in the year _____, by _____ and therefore I expect the translation to be _____

The poem **"The End"** was written by _____. It was translated in the year _____, by _____ and therefore I expect the translation to be _____

Now, before asking your teacher for the learning task, please say these words aloud:

Now I know about the poet and the translators.
What I know about the poet and the translators will help me to understand.
What I know about the poet and the translators will help me to study.

Appendix L: Metacognitive Awareness Guidance (MCAG - 3)

The Metacognitive Awareness Guidance on the following pages was administered only to Group 3 (experimental group) before they performed Assessment Task 3 (Appendix D).

Research Group_____

Name: _____ Gender: _____

School: _____ Class: _____

The passage that you are about to read is from an Encyclopedia and is called "We Dream".

Before reading the passage, write 5 questions that you think will be answered in the passage "We Dream".

1. _____?

2. _____?

3. _____?

4. _____?

5. _____?

Of the five questions you have written, select two, and answer them. Write a possible answer to each question you chose.

a. I chose question number _____

b. In my opinion, the possible answer is _____.

_____

c. I chose question number _____

d. In my opinion, the possible answer is _____

_____

The sentences below describe what you may read in the passage.

If you think that a sentence may be from the encyclopaedia, about the passage

"We Dream", circle the word **Yes.**

If, in your opinion, a sentence does not describe the passage, circle the word **No.**

1. This passage will tell about various dreams that children dream. **Yes / No**
2. This passage will present information about dreams. **Yes / No**
3. This passage will describe a scary dream that the author of the passage dreamed recently. **Yes / No**
4. This passage will describe strange dreams that people remember. **Yes / No**
5. This passage will present various facts about dreams. **Yes / No**
6. This passage will describe research on dreams and analysis of dreams. **Yes / No**
7. This passage will describe an unpleasant incident that happened to the author of the passage as a result of a dream he had. **Yes / No**

I think that the sentences I marked **Yes** describe the reading paragraph because

_____

_____

Now, before asking your teacher for the learning task, please say these words aloud:

I know a lot about dreams.
Everything I already know helps me understand.
Everything I already know will help me to study the passage.

Appendix M: Content Instruction (CI-1)

The Content Instruction (CI) on the following page together with the text of the assessment task were given only to Group 2 (placebo group), before they performed Assessment Task 1 (Appendix B).

Research Group : _____

Name: _____ Gender: _____

School: _____ Class: _____

The reading passage you are about to read is about paper.

The passage tells how paper is made and is taken from the children's newsmagazine, "Pilon".

1. **Read the passage "How Paper is Made" carefully.**
2. **When you finish reading it, you will be asked questions on what you read.**
3. ***Pay attention*: before you begin to answer the questions, be sure that you understand the passage you read and the questions you are asked to answer.**
4. **You will probably have to go back and reread the passage before you can answer all the questions.**
5. **After you answer all the questions, go back and check your answers.**

Good Luck!

The passage you are going to read this time is about paper and how it is manufactured. It is a short passage, but it will tell you about many things. And another thing: it has a few "hard" words. You will be asked to read the passage several times, and each time to do a different activity.

Read the passage and underline the hard words.

In every house, there is paper: books, notebooks and letters, bills to be paid, wrapping paper and newspapers. We hoped that the computer would save us paper, but printers continue to use whole piles of paper.

In the ancient world, people already needed to write things down, and the ancient Egyptians used papyrus. In ancient China, people cooked fibers, rags and plants that they soaked in water. They pressed this "porridge" onto a big strainer where the thin layer dried and became paper. This secret reached Europe only 800 years ago.

When the printing press was invented, more paper was needed, and people produced paper from trees. Trees play an important role in protecting the environment. Cutting down so many trees has led to a big reduction in the number of trees in the world. This is dangerous to man, animals and plants.

To protect the trees which give the world the air we breathe, we have learned to recycle* paper so that we can use it again.

We should collect all the newspapers, notebooks, torn paper bags, notes and papers we don't need and throw them into special paper-collection containers.

These containers are taken to the "Amnir" factory, where they are torn up and "cooked" to manufacture new paper, just as good as before, almost the way it was done in ancient China.

(Written by Leora Ben Yehuda, and published in "Pilon", a news magazine for children)

* recycle: to produce a new product from used materials

Appendix N: Content Instruction (CI-2)

The Content Instruction (CI) on the following page together with the text of the assessment task were given only to Group 2 (placebo group), before they performed Assessment Task 2 (Appendix C).

Research Group: _____

Name: _____ Gender: _____

School: _____ Class: _____

The poem you are about to read is called "The End" and was written by the author and poet, A.A. Milne. The poem was translated twice: once by Yaakov Orland and once by Ora Morag.

1. **Read the two translations of the poem "The End" carefully.**
2. **When you finish reading them, you will be asked questions on what you read.**
3. ***Pay attention*: before you begin to answer the questions, be sure that you understand the poems you read and the questions you are asked to answer.**
4. **You will probably have to go back and reread the poems before you can answer all the questions.**
5. **After you answer all the questions, go back and check your answers.**

Good Luck!

The End

Below there are two translations of the same poem.

The poem was written in English by the poet and writer A.A. Milne (the name A.A. Milne may be familiar to you, because he is the author of "Winnie the Pooh", and the poems in "When We Were Very Young" and "Now We Are Six").

Begin with the first translation, by Yaakov Orland:

Translation A:	**The End**	*rhyme scheme*
When I was one year old,		a
I was first born.		a
When I reached age two,		b
I was still "green".		b
Even at age three,		c
I was barely a person.		c
And only when I reached age four,		c
Did it fit me exactly.		c
When five years passed,		d
I began to catch on.		d
But now I am six, terribly clever and perfect,		e
So I think that I'll stay like this - six years old forever.		e

Now read the second translation, by Ora Morag:

Translation B:	**The End**	*rhyme scheme*
When I was a one-year-old baby,		a
I was peepee and kaka and sleep.		a
When I was a boy of two,		b
I was like nothing yet.		b
When I was a boy of three,		c
I was just a bother,		c
When I was four-and-a-quarter,		d
You could see what nature intended.		d
When I was a boy of five,		e
Sometimes I was smart and sometimes dumb.		e
But now I'm six and wow - am I smart - just perfectly smart.		f
So I think I'll stay six from now on.		f

Appendix O: Content Instruction (CI-3)

The Content Instruction (CI) on the following page together with the text of the assessment task were given only to Group 2 (placebo group), before they performed Assessment Task 3 (Appendix D).

Research Group: _____

Name: _____ Gender: _____

School: _____ Class: _____

The reading passage you are about to read is about dreams.

The passage tells about dreams and is taken from the children's Encyclopaedia, *My Body and I.*

1. **Read the passage "We Dream" carefully.**
2. **When you finish reading it, you will be asked questions on what you read.**
3. ***Pay attention*: before you begin to answer the questions, be sure that you understand the passage you read and the questions you are asked to answer.**
4. **You will probably have to go back and reread the passage before you can answer all the questions.**
5. **After you answer all the questions, go back and check your answers.**

Good Luck!

We Dream

We dream every night, but we don't always remember our dreams in the morning when we wake up. Usually we have a number of dreams every night. This was found by scientists in experiments they performed. They learned that rapid eye movements indicate that a person is dreaming. From observing the eye movements of people who are sleeping, scientists learned that people dream an average of four to six dreams a night. The length of the dream differs from one dream to another. The first dream lasts about ten minutes. The next dreams are longer. Women dream more than men, and children dream more than adults. Most people dream in black and white. Only a few dream in color.

There are many kinds of dreams. Some dreams make you happy, some make you laugh or giggle in your sleep, and some are sad. A very scary dream is called a nightmare. If you have had a nightmare, you should remember that a dream is only a dream, and that the frightening things you saw in your dream are not real.

(From *My Body and I* by J. Kaufman, p. 63, translated by Y. Kashti, in the series "Telling Pictures", published by Yavne, Tel Aviv)

Appendix P: Answer Key to Assessment Task 1

How is Paper Made?

Considerations in selecting the text:

An informative text which deals with a topic of social value - the environment (the problem of conservation of natural resources)

01. Do you know what paper is made of, and how it is made?

Cognitive level: Basic - for those who have some world knowledge

The question is in two parts:

1. What is paper made of? - short answer (wood), correct/incorrect
2. How is it made? - a composition item describing a process

Notes: Note whether the answer relates to manufacture or recycling, or both. The distinction between manufacture and recycling arises again in items 23-24.

Difficulty level: Difficult item

Note: In piloting, we discovered that the item was difficult, since many children do not have this knowledge.

Scoring: 0-3

0 - incorrect

1 - partial knowledge, information without details

2 - partial knowledge, but detailed

3 - knowledge of the entire process

Sample answers:

Score	Answer
1	Paper is made from wood and from old papers
2	You take wood and put it into a special machine which makes it very very flat (knows there is a machine which makes paper, but not more)
3	The entire process

02. ***Try to find definitions of words you didn't understand (you can ask a friend or your teacher, or use a dictionary)***

Cognitive level: High - the item demands identifying difficulty, awareness of difficulty, allows for understanding from context, the courage to admit the difficulty, and dictionary skills.

Difficulty level: Medium difficulty

Scoring: 0-3

The grade is given for performing the task, without counting the words written or considering the accuracy of the definitions.

Note: It is worthwhile utilising this item for dictionary activities in the classroom, such as collecting the word listed as difficult and their definitions, comparing the definitions to the definitions in the dictionary, and practising activities which include dictionary skills.

Below are sentences from the passage. Answer the questions that relate to them.

03. **"We hoped that the computer would save us paper"** How?

Cognitive level: High - demands comprehension from context

Difficulty level: Difficult item

Scoring: 0-3

0 - incorrect

1 - shows comprehension

3 - shows comprehension and explains

Sample answers:

Score	Answer
0	Computers will give us air instead of the trees that were cut down
1	We expected computers will help us with paper
3	That we would use computers instead of paper

04. **"In ancient China, people cooked fibers, rags and plants that they soaked in water"** Why did they do this?

Cognitive level: High - demands comprehension from context

Difficulty level: Medium difficulty

Scoring: 0 or 3

0 - incorrect

3 - correct

Sample answers:

Score	Answer
0	To make houses and boats
3	To make paper or to make porridge (the question was ambiguous, so both answers are accepted as correct)

05. **"They pressed this "porridge" onto a big strainer"** What porridge?

Cognitive level: High - demands comprehension from context

Difficulty level: Medium difficulty

Scoring: 0 or 3

0 - incorrect

3 - correct

Sample answers:

Score	Answer
0	porridge
3	To make paper or to make porridge (the question was ambiguous, so both answers are accepted as correct)

06. **"This secret reached Europe"** Which secret?

Cognitive level: High - demands comprehension from context

Difficulty level: Medium difficulty

Scoring: 0 or 3

0 - incorrect

3 - correct

Sample answers:

Score	Answer
0	that you can recycle paper
3	that you can make paper from wood, that you take the porridge and flatten it on a big strainer

Notes: 1. It is worthwhile noting errors that stem from the text, such as: the secret of the printing press. This results from the proximity of the words in the passage.

2. The item is especially difficult because the word "secret" in the context used in the passage is different from what the children are used to, because it refers to knowledge or expertise. In addition, the words "This secret" refer to previously mentioned information, and is not explained. The "secret" was known only to the Chinese.

07. What is the connection between producing paper and cutting down trees?

Cognitive level: High - demands drawing conclusions and understanding the causal relationship between two activities - manufacture of paper, and cutting down trees

Difficulty level: Medium difficulty

Scoring: 0 or 3

0 - incorrect / irrelevant

3 - correct

Sample answer:

Score	Answer
3	you make paper from wood

Note: It may be that the item was not found to be very difficult because the pilot was given in a year whose theme was the environment, and it is likely that pupils learned this material in class.

08. Why isn't it good to cut down a lot of trees?

Cognitive level: High - demands drawing conclusions on the basis of information which is not explicit in the text

Difficulty level: Medium difficulty

Scoring: 0-3

0 - incorrect or irrelevant

1 - partial answer

3 - complete answer

Sample answers:

Score	Answer
0	Because one tree is enough for at least a million pieces of paper
0	The process of making paper
1	Because trees are very important to us and to the environment
3	There won't be enough air left
3	There won't be things like fruit and other things like beauty and plants

09. The passage suggests what to do with used paper. What is the suggestion?

Cognitive level: High - the text suggests what to do with used paper ("We should collect..."), but the child has to understand the connection between these words and the expression "suggestion".

Difficulty level: Medium difficulty

Scoring: 0 or 3

Correct answer: Any answer which mentions recycling

0 - incorrect / irrelevant

3 - correct

10-14. Below is a list of questions. The answers to some of them are in the passage. Circle the questions which are answered in the passage.

Note: The instructions have been rewritten to clarify the task for the pupils.

Cognitive level: Basic - demands that the child identify details which appear in the text

Difficulty level: Easy

Scoring: 0 or 3 for each item

Correct answers: no, no, yes, no, yes

0 - incorrect

3 - correct

15. Giving a title to the passage

Cognitive level: High - demands integration of details, generalisation, and concise expression of the main idea

Difficulty level: Easy

Scoring: 0-3

0 - incorrect or

1 - partial answer

3 - complete answer

Sample answers:

Score	Answer	Notes
0	no answer / irrelevant - In Ancient China	not a relevant title
1	Paper	partially correct, but says little
2	How You Make Paper / Recycling Paper	
3	No End to Paper	clever answer
3	Don't Waste: Recycle	

Note: The following items 16-18 are intended for the teacher to get a general impression of the level of interest and difficulty of the passage.

16. *Do you think the passage is interesting?* **Yes / No**

There is no need to grade this answer; it is used to calculate distribution

17. *Do you think the passage is difficult?* **Yes / No**

There is no need to grade this answer; it is used to calculate distribution

18. *Do you think it is important to know the facts in the passage?* **Yes / No**

There is no need to grade this answer; it is used to calculate distribution

19. *Explain your answer.*

Cognitive level: High - demands drawing conclusions

Difficulty level: difficult

Scoring: 0-3

Sample answers:

Score	Answer
0	no answer / irrelevant - because we should know
1	Yes, we should know how the paper we use all the time is made
2	How You Make Paper / Recycling Paper
3	Because if we don't know, then when we grow up we might cut down trees without knowing that they are important for people

20. *Did you learn things you didn't know before from the passage?* **Yes / No**

There is no need to grade this answer; it is used to calculate distribution

21. *If you did, what were they?*

Cognitive level: High - demands integration of all information and corroboration with prior knowledge

Difficulty level: medium

Scoring: 0-3

Note: Answers on this item should be compared with answers to item 01.

Sample answers:

Score	Answer	Notes
0	yes or no answer without an explanation	
0	Yes, many things	Not an explanation
3	No, because I knew everything before	
3	That the Chinese invented paper	

Appendix Q: Key Answers to Assessment Task 2

The End

Considerations in selecting the text:

Two different translations of a children's poem by A. A. Milne. The children are asked to compare the translations, first intuitively, and then adding their personal view, taking a stand, and critiquing. Finally, they are asked to present a piece of creative writing

Cognitive level: The level of all the items is high

01. Which translation do you like better - the first or the second?

The children are asked to give their first impressions of the texts and to select one. There is no need to grade this answer; it is used to calculate distribution.

02. Why?

The children are asked to explain their instinctive answer by taking a stand. The task is based on familiarity with the genre and skills of comparison, analysis and generalisation.

Difficulty level: Very difficult

Scoring: 0 - 3

0 - offhand answer

1 - reasonable argument

3 - well-reasoned preference

Sample answers:

Score	Answer
0	The rhymes are prettier
0	In the first translation the poem is a little imaginative and a little real
1	In the second translation, the first verse is not pleasant to read, and in the second translation, the whole poem is more pleasant to read
1	Because it is funnier and more mischievous
3	Because the second translation is more childishly written
3	I preferred the first poem because it's more normal, and uses nice words without words that don't suit civilised speech. But the second poem is nice - an unusual translation.

03. Which translation is more pleasant to read?

The children are asked to give an intuitive impression and to give their personal feeling. There is no need to grade this answer; it is used to calculate distribution.

04. Why?

The children are asked to use their powers of criticism and reflection on a focused two-line text of comparable content. Note that children may not answer honestly, but rather what the teacher, who represents social norms, would expect.

Difficulty level: medium

Scoring: 0 or 3

0 - offhand answer

3 - reasonable argument

Sample answers:

Score	Answer
0	I prefer to read translation B because it's more suitable and I like it better than translation A
3	Because peepee and kaka are not pleasant to read

Which expressions in the two stanzas are "every day" expressions?

05. In translation A:

Difficulty level: medium

Scoring: 0 or 3

0 - incorrect / no answer

3 - correct expressions

06. In translation B:

Difficulty level: high

Scoring: 0 or 3

0 - incorrect / no answer

3 - correct expressions

Which expressions in the two stanzas are written in "literary" language?

07. In translation A:

Difficulty level: high

Scoring: 0 or 3

0 - incorrect / no answer
3 - correct expressions

08. In translation B:

Difficulty level: high

Scoring: 0 or 3

0 - incorrect / no answer
3 - correct expressions

09. In which poem are the child's memories more pleasant? Why?

The children are asked to synthesize all the previous tasks and to perform evaluation and criticism. For children who have difficulty this can be simplified by focusing on topics for comparison, such as memories from the age of 2 in each translation.

Difficulty level: Very difficult

Scoring: 0 - 3

0 - offhand answer
1 - reasonable argument
3 - well-reasoned preference

Sample answers:

Score	Answer
0	The words are clearer
0	It's funny and interesting in the part when the child says: "When the baby..."
1	It tells about first being born and coming into the world
1	Because these are more pleasant memories and don't describe how he made peepee and kaka
3	In my opinion, the first poem because in the second poem he tells about a hole in his head - sometimes smart and sometimes dumb, and he's a nothing meanwhile, and in the first poem they say nicer things about him
3	The first translation, because he gets smarter from year to year

10. *Why, in your opinion, does the boy in the poem think that it's a good idea for him to stay six years old forever?*

The children are asked to integrate all the messages and draw conclusions.

Difficulty level: difficult

Scoring: 0 - 3

0 - irrelevant / offhand answer

1 - argument directly from the poem - apparent message

3 - argument which requires drawing conclusions - concealed message

Sample answers:

Score	Answer
1	Because before he wasn't perfect and only now he is perfect, but after he is perfect, he won't be more than perfect
3	Because that is a very good age in the boy's opinion, an age he likes very much because it's "fun", and that's what he wanted, but it can't happen

11. *Why is the poem called "The End"?*

In addition to integrating all the messages and drawing conclusions, the children are asked to add their interpretation.

Difficulty level: difficult. The item is related to item 10.

Scoring: 0 - 3

Sample answers:

Score	Answer
0	Because it says that until the age of 6 the child will stay and won't grow and that's the end
0	Because that's the end of the poem
1	Because the boy wants to stay 6 and that's that
3	Because that is the end of the road
3	Because now he's 6 and he thinks he's perfect; he has to grow more
3	Because the boy always thinks of the future and he wants to reach the age of 6 and no more (fear of the future)
3	Because that's that - it's over! The happiest age has ended and won't ever come again
3	Because he told about his life and reached the end

Note: At the end of the activity, it is worthwhile to present to the children in the class the variety of interpretations suggested, so that they internalise the principle of a variety of possible interpretations.

The following questions 12 and 13 are not intended to be graded. The aim to develop reflective and critical thinking concerning self-awareness and cognitive processes.

12. *After you've read both poems again, have you changed your mind about the question "Which translation is better"?*

13. *If your answer was "Yes" - Why did you change your mind?*

For each child, it is worthwhile to compare the answer to question 1 with this answer, and to discuss in class the possibility of changing your mind or your stand after delving into a text, and the legitimacy of such a change.

14. *Here you can write a poem or a story which describes how you grew up and changed over the years.*

    A composition task of medium difficulty. The children are asked to express their feelings in creative writing. The children can use the format provided for writing personal ideas.

    Difficulty level: medium

    Scoring: 0 - 3

    0 - did not write / offhand answer

    1 - wrote something related to the topic but not a poem or a story

    3 - wrote a poem or a story that presented the developmental process

Appendix R: Key Answers to Assessment Task 3

We Dream

Considerations in selecting the text:
An expository text in the style of science for children, composed of a large number of details, summarized without nonessential facts. Deals with a topic of interest to children.

A. Look for the answers to the following questions in the passage

01. How do we know when someone is dreaming?

Cognitive level: Basic - demands identifying details, however there is some difficulty stemming from the complexity of the text.

Difficulty level: difficult

Scoring: 0-3

Sample answers:

Score	Answer
0	scientists did an experiment and discovered that when a person's eyes are closed, that's a sign that he is dreaming
0	When the eyes close, you know a person is dreaming
0	When someone sleeps, it means he is dreaming
1	Rapid movements of closed eyes
1	Rapid eye movements indicate that a person is dreaming
1	They learned that rapid eye movements indicate that a person is dreaming
3	They know that a person moves his eyes rapidly when he dreams
3	They know that a sleeping person is dreaming when he moves his eyes rapidly

Note: They were given 1 point for finding the correct place in the text, but beyond that it was mechanical copying

02. How many dreams does a person dream in one night?

Cognitive level: Basic - demands a basic level of knowledge that can be gotten from the text.

Difficulty level: easy

Correct answer: 4-6 dreams a night

Scoring: 0 or 3

03. How long does the first dream last?

Cognitive level: Basic - demands a level of knowledge that can be gotten from the text.

Difficulty level: easy

Correct answer: about 10 minutes

Scoring: 0 or 3

04. How did scientists discover how many dreams a person dreams in one night?.

Cognitive level: Basic - demands identifying details in the text. There is some repetition of item 01, so it is worthwhile comparing these two answers. In addition, a class discussion can be held on scientific procedures and research methods.

Difficulty level: difficult

Scoring: 0-3

Sample answers:

Score	Answer
0	they did an experiment
1	eye movements of sleepers
3	watching eye movements of sleepers
3	because they noticed how many eye movements there were

05. What is a nightmare?

Cognitive level: Basic - demands identifying details in the text.

Difficulty level: easy

Correct answer: a very frightening dream

Scoring: 0 or 3

06. Did you find anything in the passage that surprised you? Check: Yes __ No __

There is no need to grade this answer; it is used to calculate distribution

07. If your answer was yes, write what surprised you.

Difficulty level: difficult

Scoring: 0-3

Sample answers:

Note: Students who showed world knowledge and life experience in their reaction to text got 3 points.

Score	Answer
0	negative answer
0	It was the first time I remembered a dream
1	There are people who dream in colour
1	I was surprised that we dream at night and don't remember in the morning
1	I was surprised that they know that someone is dreaming
1	That a person is dreams 6 dreams
1	That scientists know how long the first dream lasts
1	It says that women dream more than men
1	How scientists were able to know how many dreams people dream
3	I didn't know that people dream in black-and- white (all the dreams I remember are in colour).
3	I was once told that people dream 10-15 dreams, and here it says 4-6.
3	I was surprised that the first dream lasts 10 minutes and that we dream so many dreams. I thought I dream at most 3 dreams.

08. Are there other things that you would like to know about dreams, and were not explained in the passage? If there are, write what:

Cognitive level: High - demands integration of all the information in the text. It allows for 3 possibilities:

1. Composing new questions on the basis of given information
2. Showing curiosity and interest in the topic
3. Showing prior knowledge and life experience about dreams in relation to the information in the text.

Difficulty level: difficult.

Scoring: 0 - 3

0 - did not write / incorrect answer (not according to instructions) / not related to topic

1 - wrote something related to the topic but not according to instructions

2 - one relevant answer

3 - two or more relevant answers

Sample answers:

Score	Answer	Notes
0	How often do I turn over at night?	
0	What happens to my body when I sleep?	
0	Why do we sleep at all?	
0	Why do we yawn?	
1	How does a person feel the dream he is dreaming?	This question is answered in the text
1	How does he know how many dreams he dreams?	This question is answered in the text
2	How can you know by looking at a person's eyes that he is sleeping and how many dreams he is dreaming?	
2	How do we know what kind of dream we are dreaming?	
2	I want to know if there's a connection between experiences we have and our dreams.	
3	Why do we dream at night?	
3	What happens when we dream?	This question gets no points
3	How do we dream in black-and-white?	This question gets no points
3	How do people smile in dreams?	
3	Why do women dream more than men?	
3	Is it true that dreams transmit information?	

09. If you want to, you can write about or draw a picture of a dream.

New item - has not been piloted.

Appendix S: Scoring Guidelines for MCAG-1, 2, 3

Metacognitive Awareness Guidance items are generally graded on a scale of 1 to 3.

When a Yes/No answer is called for, the mark is either 0 or 3 (0 = wrong, 3 = correct).

When open answers are required, the following are the criteria for each grade:

(1) Unsatisfactory - Responses which demonstrate

- little or no use of ***context information***, information given to the treatment subjects at the beginning of each of the MCAGs, and the knowledge they bring to the reading assessment sessions.
- little or no understanding, i.e., by providing isolated lists of information.
- little or no ability to integrate the given context information into their answer, i.e., irrelevant prior knowledge, irrelevant answer.

(2) Partial - Responses which demonstrate

- some use of context information
- some understanding, i.e., by providing some information
- some ability to integrate the context information given to their answer, the learner using partially relevant prior knowledge that can or can't be applicable to the task, topic, or issue

(3) Extensive - Responses which demonstrate

- use of context information, e.g., the learner clearly identifies and elaborates on the topic and considers the topic through relevant, accurate, and adequate prior knowledge. Responses move beyond simple description
- activation of prior knowledge, i.e., by linking answer to the problem or topic
- use of language from the semantic field of the relevant knowledge.
- use of context information and creating linkage

All items on the MCAGs have a cognitive and a difficulty level of 3.

Appendix T: Answer Key to Metacognitive Awareness Guidance 1 (MCAG-1) - "How Paper is Made"

1. Before reading the passage, please try to answer the following questions: What do you think paper is made of?
   In my opinion, _____

   Scoring 0 or 3

   0 - Wrong answer, everything except wood
   3 - Wood

2. What problem could there be when manufacturing paper?
   In my opinion, _____

   Scoring 0 - 3

   0 - No answer
   1 - Irrelevant answers, such as "I have no idea", "it is very hard to make paper", the paper is flat and the wood is round", "the tree is too big", "it is very dangerous to cut trees"
   2 - Use of partly relevant prior knowledge that may or may not be applicable to the subject such as "it is wrong to cut trees"
   3 - Answer which clearly considered the issue, used and activated relevant prior knowledge such as the mentioning the effect on the environment

3. What solution can you suggest to the problem that you raised?
   The solution, in my opinion, is _____

   Scoring 0 - 3
   0 - No answer
   1 - irrelevant answer such as "ask expert", "just find a solution", "I have no idea"
   2 - answer which deals with a problem which may or may not be applicable
   3 - The solution, as presented, uses relevant prior knowledge and makes a coherent link between the knowledge, the problem, and the solution.

4. Write a short paragraph to fit the title "**How Paper is Made**", using the following words: **paper, wood, manufacture, recycle**

   Scoring 0 - 3
   0 - No answer
   1 - irrelevant answer such as "recycling the wood"
   2 - Wrote the words without referring to the problem
   3 - Identified the problem, expressed understanding and thoughts by using and activating relevant prior knowledge and by linking this to the problem and to the solution, while using appropriate language from the semantic field.

Appendix U: Answer key to Metacognitive Awareness Guidance 2 (MCAG-2) - "The End"

1. In your opinion, will there be a difference between the first translation and the second one?

Scoring 0 or 3

0 - Wrong answer - there will be no difference between the translations

3 - Right answer, there will be a difference

2. What is the difference? I think that _____

Scoring 0 - 3

0 - No answer

1 - Irrelevant answer

2 - Partially relevant, however repeated the information without any conclusion or linkage such as "good and bad translation", "old and new translation"

3 - Reached conclusions, justified them by using context information, created linkages

3. Do you think that these facts will influence the style of the translation?

Yes ___ No___

Scoring 0 or 3

0 - Wrong answer
3 - Right answer

4. Before reading the two translations, complete the missing words and repeat to yourself:

The poem **"The End"** was written by (1) _____. It was translated in the year (2) _____, by (3) _____ and therefore I expect the translation to be (4) _____ .

Note: Answer 4 requires elaboration, explanation, and conclusion. Answers 1,2, & 3 require basic reading skills (input and output of information)

Scoring 0 - 3

0 - No answer
1 - Completed all four answers incorrectly, i.e., "new and old", "good and bad", "easy and hard"
2 - Completed at least two answers correctly, including answer 4
3 - Completed at least three answers correctly, including answer 4

Appendix V: Key Answers to Metacognitive Awareness Guidance 3 (MCAG-3) - "We Dream"

1. Before reading the passage, write 5 questions that you think will be answered in the passage **"We Dream"**.

   Scoring 0 - 3

   0 - No answer
   1 - Irrelevant questions with no use of given context information
   2 - Three questions indicate use of given context information.
   3 - At least four questions indicate use of given context information.

2. Of the five questions you have written, select **two**, and answer them. Write a **possible answer** to each question you chose.

   Scoring 0 - 3

   0 - No answer
   1 - Irrelevant answer
   2 - Suggested answers do not indicate link to the questions and/or use of context information
   3 - Suggested answers indicate use, activation and awareness of context information and/or indicate clear linkage to the questions.

3. The sentences below describe what you may read in the passage. If you think that a sentence may be from the encyclopaedia about the passage **"We Dream"**, circle the word **Yes**. If, in your opinion, a sentence does not describe the passage, circle the word **No**.

   Scoring 0-3 (Sentences 2, 5, 6 - Yes, Sentences 1, 3, 4, 7 - No)

   0 - No answer
   1 - 1 to 3 correct answers
   2 - 4 or 5 correct answers
   3 - 6 or 7 correct answers

4. I think that the sentences I marked **Yes** describe the reading paragraph because

   Scoring 0 - 3

   0 - No answer
   1 - Irrelevant answer, no connection between answers and reasoning
   2 - Partially relevant, however repeated the information without any conclusion or linkage, such as "it is important", "it makes sense", "I want to find the answer"
   3 - Marked answers are supported by activating and using context information; clear connection between answers and reasoning.

Appendix W: Guidelines for Teacher Interviews

Four teachers whose classes received the metacognitive awareness guidance (experimental group 3) were interviewed. Following are the guidelines for the interviews.

1. **What were pupils' reactions to the activities of the study (both the guidance and the task itself)? Did they ask questions, or make comments, or did they only perform the tasks and hand them in?**
2. **Was there any effect on the learning-teaching environment in the class as a result of participating in the study; e.g., was there any effect on your teaching or on the learning of your pupils, or was the experiment performed and then forgotten?**
3. **Did anything at all change in your specific way of teaching (even on the level of thoughts)?**
4. **Do you think there is any pedagogical importance in metacognitive guidance of the sort your pupils experienced? Do you suppose that this will have an effect on teaching or assessment tasks?**

Appendix X1: Teacher Interview - School 1 - G

One of the questions that recurred while my pupils were performing the three tasks was whether they would receive a grade on the metacognitive guidance as well as on the assessment task. This concerned them a great deal, especially the better pupils, possibly because they had to write more. Each time they received a task, at least 5 pupils asked again. In my instructions to them, I had told them that they would get a grade, and that the answers to the questions they answered before the task would have some weight in how I determined the final grade for the task.

Another interesting point in this connection is that after each task, I heard a number of pupils arguing and discussing the guidance questions. I didn't hear any direct reference to the reading passages of the tasks, but I did to the guidance questions. And that got me thinking, and I decided to use guiding questions of this sort on a history test that was scheduled for two weeks after the class did the activities in your study. The test was on the Declaration of Independence. Before I gave them the test questions, I asked them to answer 3 questions of the kind you gave. Do you remember the writing task for "How Paper is Made" where you asked them to write a paragraph using certain words? Well I gave them a similar task. I asked them to write 2 paragraphs (at least 10 lines) and use the words 'citizen', 'rights', 'duties', 'nation'.

I gave two additional questions about the context of the time: to write what happened in the 3 years before the establishment of the State, and what happened in the 3 years after it. I can show you the pupils' answers - it was fascinating. Another thing I did was to announce that for the guiding questions, they would get 30 points, and on the test, 70 points - that was my way of telling them that it was important, and that's how I could know it was important to them.

One of the most interesting things I discovered as a result of this experience was that the answers to the questions on the test were longer and more detailed, and more relevant to the subjects we studied. The pupils used the introductory questions that they answered in the guidance for explanations, reinforcement, and as a basis for their answers on the test. For me this was fantastic because usually their answers are short and trite.

But I have a problem with grading the guidance questions. I have no doubt that their knowledge and their answers on the guidance affects their performance on the test, and what happens is that when I find that pupils who got only 10 out of 30 points on the guidance, and 30 out of 70 points on the test, I have a hard time deciding what to do about their final grade. Because if they lacked the context and the knowledge which others had, they received a lower grade. Is that fair? Do you understand my dilemma? - I don't know if it's fair to give them a 45 when now it's clear to me that if they had more background knowledge, they would get a higher grade on the test. This dilemma takes me back to the way I teach, and the whole problem of tests.

I would be very happy if you could find the time to come and tell us about your findings, and even more, how you explain them.

Appendix X2: Teacher Interview - School 2 - K

Look, about the metacognitive guidance as you call it, I actually use questions of this sort all the time. These aren't new questions - 'headlines', 'brainstorming' and 'rays of sun' are actually the same thing.

Sometimes I give a homework assignment to prepare 'rays of sun' for a topic, or a list of words or topics connected to a new topic which I am about to teach. But then, a problem arises. Because these kinds of questions don't have only one correct answer, all the pupils want to read their answers, to present their 'sun', and to read the list of words they collected and explain it. And then I have to take an enormous amount of time in checking their homework, because if I don't let pupils present, they are hurt and offended. Because for some reason they are more attached to that kind of homework assignment. And then imagine - everyone describes, explains and argues and we have 30 pupils in the class, it's not easy. It's a very difficult problem with this kind of homework assignment or task - this has to be taken into consideration.

You must have had the same problem when you checked the answers to the questions you gave before the tasks, because the answers can be very different and varied. More than once I have "wasted" a whole lesson dealing with this and I never got to the material, and that frustrates me. Sometimes I say to myself that it's worthwhile investing the time in the text itself, and not in what is around it. I'm willing to waste time on a question like 'what does this tell you?', 'what does this remind you of and why?', but when you get to the material, it's less interesting. And I don't need to tell you that we have to get all the material done, and it's impossible to do background stuff all the time.

What did happen in class regarding the study was that before we started the topic "Problems with water in Israel", I did some brainstorming on the subject, and the blackboard was full of words, topics, problems, names (and of course, almost an entire lesson passed), and then one of the pupils (a weak pupil, as a matter of fact) all of a sudden said, "And now I say to myself out loud...." - you remember the activity that

ends each guidance you gave. The whole class started to laugh, and I must admit that I did too.

I will be very happy to know whether the pupils who received the metacognitive guidance did better on the assessment task. Maybe this would be the excuse I am looking for to justify dealing more with background things.

I am not sure that that is the case. I think that sometimes it's a diversion from the main point. I hope you will tell us about the results.

Appendix X3: Teacher Interview - School 3 - BR

To tell you the truth, there was quite a bit of complaining about the guidance questions - "What do we need this for?" and "Why can't we just do the task?" After the first task, there were pupils who asked if they could do only the guidance and not do the task.

There was a sort of lack of quiet in the classroom. When I thought about it, I realised that the guiding questions extended the length of time the pupils had to concentrate, and they made each task longer. This is a problem for those children who have difficulty concentrating as it is, and actually, when I think about it, it was the weak pupils who asked a few times if they could do only the guiding questions.

Maybe the guidance should be shortened, or integrated into the assessment task, because the pupils concentrate and make an effort writing, and then they are told, "You're not finished; actually, now you are beginning the task." They aren't used to working that way and that's what made them a bit unsettled and displeased. I wonder if that affected their results on the task.

Another thing I saw, and I have to mention is that when we talked about the tasks from your research afterwards, the pupils remembered more questions from the guidance than from the tasks and that bothered me. Because the guidance didn't refer directly to the text they read, while the task questions did. If you really discover that the grade on the task is higher because of the guidance, I think that will be interesting because actually what comes out of this is that we can affect pupils' grades without giving them the answers to specific test questions, and maybe that is the advantage of questions like this.

Regarding my teaching methods, to tell you the truth, I didn't really think about it. I always go over the title of a text with my pupils to create expectations regarding the new material which we are about to read. I didn't have enough time to really learn the

subject of metacognition because it's the end of the year and we were busy with other things, but maybe next year, I'll do something with this.

Actually there is something that I adopted from the research. Do you remember the final part of each guidance "Now say to yourself out loud, I know..." When we finish a topic in class, I always sum up with a few points or with a summary. But now, instead of using the words "summary", "conclusions" which I used to use, I write:

"As a result of what we learned, I say to myself....

I remember....

I know...."

This is certainly the influence of the research. Aside from that I can't think of anything.

Appendix X4: Teacher Interview - School 4 - BL

In my class, there was something very interesting in relation to my pupils' experience with this research. I don't know if in other classes there was the same reaction, but my pupils began to repeat the sentence at the end of the guidance, "And now I say to myself out loud.... And now I know.... What I know will help me.... Now it will be easier for me to answer the questions."

This has been a joke in class ever since the research. Sometimes they say it in the proper context, and sometimes they just say it. To tell you the truth, I thought quite a bit about it, because children have a tendency to make fun of things that make sense to them, but which they aren't used to.

[I asked "Did you ask them why they remembered this and why they laughed at it; did you talk about it with them more seriously?"]

No, I didn't talk to them or do anything about it. Look, I usually do guidance of this sort before every text we read, and we check the title - what does it tell us? Where is the text from? What do we expect will be written in the text and why? These are pretty routine questions; it's not new. I went over the questions you gave in the guidance a bit, and some of them are the kind we use and ask in the course of our regular teaching. But I don't give questions like these before a test; this seems to me to be a task on top of a task, and it is exhausting for the pupils. Even so, it isn't easy for them to concentrate for a long time. They work very hard, and it isn't easy with all the innovations that are thrown at us. What did happen is that they constantly ask what the results were and what you found in your research and what was decided regarding the format of the tests. I too am interested. I'm interested to know what the results are, if the questions you gave before the tasks helped or confused the pupils. If you have significant results, it would be worthwhile next year to learn about this a little more in depth. The subject of metacognition is pretty new to me.

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