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Doctor of Philosophy

THE ROLE OF METACOGNITIVE STRATEGIES IN PROMOTING LEARNING ENGLISH AS A FOREIGN LANGUGE INDEPENDENTLY

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

By

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USE OF THESIS

ABSTRACT

One of the challenges facing universities in Thailand is that of equipping graduates with the capacity for independent analytical thinking and learning which will enable them to operate in a global context while also contributing constructively to the changing needs of the local scene. The ability to think analytically and to learn independently calls for learners to be purposeful, strategic, and persistent in learning as well as to have more adaptive cognitive processes and the willingness to take charge of their learning. This is the role of metacognition in learning autonomy across domains. This thesis reports on research which has investigated the role of metacognitive strategies in promoting learning EFL independently.

In the area of language learning, two approaches have been used in previous research. One involving metacognition has yielded very successful results in learning while another, without metacognition, has yielded mixed results. Some very successful training projects have made cognitive and metacognitive strategies explicit to learners, whereby learners have been introduced to 'what, why, how, when and where' of strategies and how to evaluate their effectiveness. Learners' background knowledge and the selection of strategies to suit particular learner's needs were reported as the main obstacles. At the tertiary level this is of some concern as learners' conceptions and experiences from different disciplines may impede their independence in language learning disciplines such as English. In Thailand, these learner variables are unclear and pose a challenge for English instructors whose aims are to enhance learners' ability and willingness to make use of resources available outside classroom.

The ultimate purpose of this study has been to provide the impetus for training independent English language learners in two different discipline areas, namely the Sciences and Arts. Thus the research investigated students' and instructors' perceptions and use of strategies in learning and teaching. Also considered was students' transferral of metacognitive strategies from learning their subject discipline to learning English. To achieve this, a combination of quantitative and qualitative research approaches were undertaken to allow the researcher to access the strategic learning activities that students adopted.

Multiple data collection instruments involving interviews, the survey questionnaires, self reports and 'think-aloud' protocols were used with both students and instructors in the Agricultural Sciences and Communication Arts. The study site was a university in a provincial city in Thailand. The quantitative data were analysed using SPSS version11 for Windows, while the analysis of qualitative data followed grounded theory after Strauss and Corbin (1990) and Huberman and Miles (1994).

Results show that students in both disciplines perceived the relevance of and used metacognitive strategies which ranged from lower to higher metacognitive processing. Their use of these metacognitive strategies related highly to perceptions of relevance, particularly among Communication Arts students. Both groups had developed some metacognitive strategies, particularly *Monitoring* and *Evaluating*, and used them in learning the MSC independently.

While some individual strategies are used only in Agricultural Sciences or Communication Arts, the evidence was insufficient to conclude that there are discipline-specific strategies. Despite this, there was a tendency for Agricultural Science students to deal with a problem in learning the MSC alone, while their Communication Arts peers were more likely to use cooperative strategies. In addition, Agricultural Science students were likely to give up more easily. A more striking difference between the two groups of students was that Communication Arts are more strategic than Agricultural Science students. That is, compared with Agricultural Science students, Communication Arts students recorded a wider variety of metacognitive strategies as relevant to their learning and also used a wider variety of strategies when learning either the MSC or English.

In terms of transfer of perceptions of relevance and strategy use, relatively few metacognitive strategies at the higher level metacognitive processing were carried over from the MSC to English. Yet, more metacognitive strategies were transferred by students in Agricultural Sciences than by the Communication Arts students.

Even though Agricultural Science instructors provided more metacognitive strategies, instructors in the two disciplines were common in the metacognitive strategies they perceived as relevant and incorporated into their teaching. This included in particular strategies which involved *Monitoring* and *Evaluating*. Neither group of instructors put importance on the relevance and the inclusion of *Planning* and *Problem-solving strategies*. Generally, these strategies were taught to students without explicit discussion of their relevance and how to use them effectively.

This study therefore established a tentative conclusion that to some extent the instructors in these two disciplines does have an influence on their students' perceptions of relevance and use of metacognitive strategies. Nonetheless, these students have developed some metacognitive strategies independently of their instructors' guidance.

The results also show the importance of all four metacognitive processes in learning English independently. That is, when learning the MSC, the effective control and regulation of learners' metacognitve knowledge when listening or reading through *Planning*, *Monitoring*, *Problem-solving* and *Evaluating strategies* encouraged most Agricultural Science and

Communication Arts learners and developed their confidence to take charge of their own learning. However, the absence or ineffectiveness of some strategies, particularly for *Planning* and *Problem-solving*, prevented these learners from engaging in the independent learning of English.

A list of metacognitive strategies appropriate for training students in the two disciplines was derived from the findings and complemented with those deemed successful in FL/SL learning in previous research. Based on the findings, the inclusion of all four metacognitive processes in the Thai curricula was recommended. Suggestions for classroom instruction, as well as for further study, have also been made.

DECLARATION

I certify that this thesis does not, to the best of my belief:

i. incorporate without acknowledgement any material previously submitted for a degree or diploma in any institution of higher education

ii. contain any material previously published or written by another person except where due reference is made in the text; or

iii. contain any defamatory material.

Signed

Date: 1 December 2006

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1. INTRODUCTION

This study was designed to investigate the existing metacognitive strategies of students and instructors from Agricultural Sciences and Communication Arts in order to promote learning autonomy in English as a foreign language in Thailand. The investigation moves from gathering general knowledge about how participants learned and taught and thought about teaching and learning in Sciences and Arts to the strategies specific for listening and reading both in the native language and in English. The strategies investigated were selected from previous literature by the researcher and those actually used by informants. Interviews, the questionnaires, the self reports and the think-aloud protocols provided a combination of data collection approaches.

This chapter explains the background to the study. The significance of the study is outlined in terms of the broader impact on developing learning EFL independently and specifically in listening and reading. The purpose of the study and research questions and the definition of terms are included. The rationale for the study demonstrates its necessity.

1.1 BACKGROUND TO THE STUDY

The independent learning strategies of foreign language learners who have different backgrounds have been an important issue for instructors and educators for decades. The same interest occurs across curriculum because independent learners, or autonomous learners, are the ultimate goal not only in the field of language learning but also in other fields of study. This is because knowledge in the information technology era is so extensive and changeable that no one can be explicitly taught it all. This in turn creates an urgent need for people with the capacity to learn by themselves throughout their life.

Literature on learning autonomy alludes to the importance of learner variables, both cognitive and affective (Littlewood, 1996, pp. 75-79; Sheerin, 1997; Zimmerman, 1995). Two components of autonomy are the learner's willingness and ability to take responsibility for learning. These two components, and the resultant responsibility that autonomous learners assume, involve metacognitive knowledge and metacognitive experiences (see for example, Little, 1991; Purdie, Hattie, & Douglas, 1996; Zimmerman, 1995).

Metacognitive knowledge and metacognitive experiences are seen as components of metacognition by Flavell (1971; 1979; 1981). Metacognitive knowledge refers to knowledge about one's own cognitive and affective states and activities and control over this knowledge in order to achieve the specific goal. Cognitive states and activities involve knowledge of the world, of a person's knowledge and capabilities and strategic knowledge. Affective states and activities concern knowledge of abilities, attitudes and motivation. Such knowledge can be classified into declarative (e.g., **what** the knowledge is, **why** the knowledge should be learned), procedural (**how** to use the knowledge) and conditional knowledge (**when and where** to use the knowledge as well as **how to evaluate** its effectiveness) (Brown, 1987; Carrell, Gajdusek, & Wise, 2001; Kluwe, 1987). Metacognitive experiences involve awareness of one's own cognitive and affective processes. These experiences are retrieved by actively monitoring one's own mental processes.

Evidence from numerous studies discloses how learners realise the benefits of metacognition. For instance, Davidson and his colleagues (Davidson, Deuser, & Sternberg, 1994; Davidson & Sternberg, 1998) provide evidence in the domain of general problem solving, McInerney, McInerney and March (1997) in the domain of computer science; Carr, Alexander and Folds-Bennett (1994) in mathematics; Antonietti, Ignazi and Pereco (2000) in psychology and Goh (1997), Oxford, Park-Oh, Ito and Sumrall (1993), Miserandino (1996), Victori and Lockhart (1995), White (1995) and Fleming and Walls (1998) in language learning. These scholars reveal that, apart from being the key factor in distinguishing successful learners from less successful learners, metacognition also enriches students with more motivation, more engagement in learning tasks, more tolerance, more persistence, more participation, more curiosity and more confidence, as well as improving their self-esteem as learners. Moreover, Metacognition has also been found to be an indicator of success in learning across the curriculum (Davidson et al., 1994; Goh, 1997; McInerney et al., 1997; Oxford et al., 1990; White, 1995).

With regard to language learning, Fleming & Walls (1998) reveal that good learners take active responsibility for their own learning and use a range of strategies which enable them to plan, monitor, manage and reflect on the process of learning a second/foreign language. They also find that metacognitive strategies are closely linked to the development of learning autonomy. Among the numerous categories of learning strategies proposed by many experts (for example, Chamot, Barnhardt, El-Dinary, & Robbins, 1999; Flavell, 1979; Oxford, 1990), metacognitive strategies are seen as an important means to achieve the goals.

The implementation of learning strategies has been grouped into two schools of thought. One has investigated training in strategies that were found to be effective for learning or for better learning. The second has studied the transfer of effective strategies with metacognitive components to students. These studies include all or some components such as declarative ("what the strategy is" and "why the strategy should be learned"), procedural ("how to use the strategy") and conditional knowledge ("When and Where to use the strategy" and "How to evaluate its effectiveness") in instruction either explicitly or implicitly (Carrell et al., 2001, pp. 235-239). Robbins (1999) describes explicit strategies instruction as the method by which this knowledge about strategies is discussed openly. With implicit instruction, the strategic knowledge is embedded into learning activities without explanation about them or their effectiveness.

The outcomes of strategy training have not been very successful. Some attempts have met with mixed success (Remmert, 1997; Schoonen, Hulstijn, & Bossers, 1998) some have not (Chamot, 1993; O'Malley, 1987) and one programme was so unsuccessful that it had to be abandoned (Wenden, 1997). Remmert (1997) points out that one of the obstacles she met while trying to help learners take an active role in their learning included the difficulty of preparing learning strategies that suit students' needs.

In an attempt to promote learning autonomy, recent literature in cognitive constructivism and conceptual change stresses the important role of learners' existing knowledge in learning and transferring new information. Psychologists who study conceptual change in the cognitive construction of knowledge describe how strong and long lasting conceptual change in the learner can be achieved through interaction between five factors: individuals' existing knowledge, motivation, message effects and high metacognitive engagement (Dole & Sinatra, 1998). Based on this interaction, recent research (Georghiades, 2000) reveals that independent learning is possible if learners are able to transfer their acquired knowledge to new situations either in the same subject area or other fields. Additionally, successful programs promoting independent learning of FL rely heavily on learners' existing learning strategies (Victori & Lockhart, 1995). Only one of forty-one participants in Victori and Lockhart's study who exhibited the use of learning strategies failed in trying to apply learned strategies to other tasks.

Most models for strategy implementation give priority to helping students identify their prior knowledge about strategies in the initial step of training. However, being able to independently apply learned conceptions, strategies or skills is not easy to achieve and takes time (Georghiades, 2000). Evidence on students' existing conceptions, strategies or skills is pitifully poor.

It would be expected that students from different domains would have been trained in or possess different learning strategies. Yet, whether their existing strategies are the same or different has not been defined. We know relatively little about what students have learned about learning before they come to language or other classes. We only know that some students come to their studies at the university with varying levels of background knowledge in learning strategy use and that all students can benefit from help in improving their learning strategies. They need to be shown how to be flexible and enriched with ideas about what to do (Leki, 1995). Such a useful aspect of learning has unfortunately been ignored.

The situation in Thailand is no different. In accordance with government policy, the mission of all education institutions is to produce independent learners, however, the traditional teacher centered curriculum dominates the teaching and learning process in both schools and universities. Teachers and lecturers transfer knowledge and experiences to students with the aim of helping them pass examinations. The core roles of students are listening and taking notes and it is perceived that all information in lectures consists of answers to the examination questions (Office of the National Economic and Social Development Board, 2000). On the other hand, in real life people learn from a range of resources, such as problem-solving, sharing information and communicating with each other (Clifford, 1999). The mismatch between real life and academic study in Thailand not only causes students and instructors to feel trapped within their disciplines, but also creates obstacles for helping learners develop the ability to learn by themselves.

Rajabhat Institute Ubon Ratchathani (RIU) is one of many universities in Thailand that have encouraged change. According to the curriculum, only two English courses (English for Communication and Information Retrieval and English for Specific Purposes) are compulsory for undergraduates. Nevertheless, many resources, such as printed materials, language laboratories, and telecommunications and computer technology, are provided. In addition, students have opportunities to be guided in how to learn in classroom settings and are encouraged to practise using their strategies. However, only a few students are found making use of these resources. It is possible that they lack the means to learn independently. Based on the information from their respective fields, students may move easily towards independent learning in a foreign language. However, this appears not to happen. Therefore, the existing metacognitive strategies which students from different disciplines bring with them to English classes need to be critically investigated.

1.1.1 Purpose of the Study

In this study, the researcher aims to achieve the following results.

1. An understanding of what learning strategies learners from given disciplines perceive they use and what strategy training they need in order to become independent learners of English as a foreign language.

2. An understanding of the perceptions of instructors from given disciplines concerning metacognitive strategies and how their teaching is influenced by this awareness.

3. The ability to provide learners from different disciplines with a list of appropriate language learning strategies, and metacognitive strategies in particular, for discipline-specific training needs.

In accordance with these purposes, three research questions arise.

1.1.2 Research Questions

1. Which learning strategies are students aware of in learning subject matter content? Which strategies do they perceive as relevant and does this affect their use of strategies? Do the strategies vary across disciplines?

2. Do instructors in given disciplines perceive certain metacognitive strategies as relevant to learning independently in the disciplines? If so, how does this perceived relevance affect their teaching of these strategies to their students?

3. Which metacognitive strategies, if any, do students transfer from learning the discipline subject to learning English? Which strategies do they need to be trained in in order to be able to learn English independently?

1.1.3 Definition of Terms

Metacognitive strategies, called self-directed learning skills in the methodology literature, or regulatory skills in the cognitive psychology literature, refer to executive processes that govern and direct other thought processes when planning, monitoring, evaluating, and regulating solution activity (Brown, 1987, p. 79; Flavell, 1987). According to the interaction of these processes in metacognition theory, cognitive and emotional awareness retrieved from the monitoring or evaluating process is further interpreted, supervised and/or commanded by "a central processor" (Brown, 1987, p. 79; Flavell, 1987; Mazzonio & Nelson, 1998). In other words, this executive controller controls one's thoughts and makes decisions about how much further processing is necessary for future performance. This is procedural knowledge that is reportable and accessible to either consciousness or automation. The Metacognitive strategies investigated in this study cover any category of learning strategies, i.e., cognitive, metacognitive and social-affective, that is used in the four metacognitive processes of *Planning, Monitoring, Problem-solving* and *Evaluation*.

Independent learning, of interest here, is the learners' willingness and ability to take responsibility for their own learning and to develop effective learning strategies. The responsibility that independent learners assume involves the four metacognitive processes above.

Instruction in English as a foreign language in this study refers to a situation of teaching and learning English in which the opportunities to practice the language mainly occur in academic settings.

1.1.4 Significance of the Study

Metacognitive strategies play an important role for success in learning across disciplines as well as being closely linked to the development of independent learning. Many contributions to research suggest that metacognition is common to learning both content and language learning, although there is some evidence that metacognition is specific for a particular area of study. Therefore, insight into the metacognitive strategies that students from different disciplines possess and the interaction of the strategies when learning content knowledge and language is an initial step to promoting language learning autonomy. Understanding of learners' existing knowledge and experiences and learning about learner independence (in learning the major subject discipline) can provide teacher/instructor with clear and explicit guidelines on how learners can develop their independence in language learning. Consequently, learners will be enriched with adequate learning strategies to develop a love of learning and "learning how to learn". Furthermore, this study will better prepare learners to take up occupations in the community or elsewhere with sufficient confidence and with the alertness to continue to improve through new information and knowledge.

This study can also provoke the awareness of students to the possibility of transferring learned strategies to new situations either between listening and reading or between the major content and language learning.

1.2 RATIONALE FOR THE STUDY

1.2.1 Learning a FL Independently

Based on the responsibility of independent learners recommended by Sheerin (1997) and Little (1991), the tasks of learning a foreign/second language require well developed metacognition by which people are aware of their knowledge and can control and regulate that knowledge in order to achieve a particular goal.

Shifting the responsibility in learning to learners requires special focus especially at the initial level. Clifford (1999) found in her seven-year exploration on the development of autonomous learners in a New Zealand University that although students reported the advantages of autonomous learning, they felt it was difficult for them to employ some activities by themselves. Sheerin (1997, p. 58) observed that "a learner might be willing and able to work unsupervised, but in every other respect they depend on a teacher or advisor for direction."

Robbins (1999) and Yang (1998) provide evidence that teachers play an important role in promoting students' awareness of language learning strategies, their self-direction in learning, as well as their experience of overall autonomy.

In an attempt to promote learning autonomy, literature in cognitive constructivism and conceptual change stresses the importance of learners' existing knowledge in learning and transferring new information. The mixed results of instruction in learning strategies which promote learning autonomy emphasises the interaction of these components of independence. The obstacle is that a transfer of learning takes time. However, based on existing knowledge and experiences, i.e., independence as a learner, as a person and as a communicator, obstacles caused by transferability seem to be no longer problematic (Littlewood, 1996). In Littlewood's view (1996), willingness involves motivation and confidence and ability relies on knowledge and skills. Student's motivation is reinforced by confidence, and a systematic approach to familiarising learners with the knowledge and skills required to increase their ability establishes this confidence and willingness to take responsibility for their own learning, thus, enhancing learning autonomy.

Independent learning is also governed by environment, in this case the constraints of university. Marshall and Rowland (1993, p. 27) describe how tertiary institutions are usually divided into faculties, departments or schools, each representing closely-related bodies of knowledge called disciplines. Some institutions separate the disciplines into departments that teach what are considered'subjects' in their own right. Each of these disciplines or body of knowledge is a culture in its own right with its own discourses, its own language and vocabulary and its own methodologies for choosing, analysing, interpreting and presenting this knowledge. Two prominent cultures of the university are the sciences and the arts (Anderson, 1993).

Anderson (1993, p. 128) describes sciences as "one mode of systematic thought, one way of trying to wrest meaning from the world, one technique in the effort to make good on an idea of purpose". All disciplines following scientific rationalism are committed to teaching reliable knowledge and dependable practice that have been probed and questioned from every angle. Arts disciplines attempt to expand knowledge about human beings and include, for example, humanities or social sciences, language and communication. They cover a wide range of disciplines such as the "psychological, sociological, economic, political, anthropological and historical" (Anderson, 1993, p. 133). Studying each discipline therefore calls for different approaches and learning strategies. Therefore, participants in this research have been selected from the Sciences (Agricultural Sciences) and from the Arts (Communication Arts).

Learning Strategies are "a collection of cognitive or mental tactics that are used by an individual in a particular learning situation to facilitate learning" (Derry, 1986, p. 1). To date a number of types of learning strategies are proposed by numerous educators, for instance, McKeachie, Pintrich, Lin and Smith (1987); Chalmers and Fuller (1996); Oxford (1990); Wenden (1991) and Chamot, Barnhardt, El-dinary and Robbins (1999). McKeachie et al. (1987) and Chalmers and Fuller (1996) provide sets of effective learning strategies for studying at a university others provide effective strategies students used for FL/SL learning. Strategies have been described in different categories, however, most involve cognitive, metacognitive, resource management or social-affective categories. The cognitive category covers strategies concerning the retrieving, encoding, understanding and storing of information. The metacognitive, self-management, self-regulation or self-direction strategies are those by which learners “oversee and manage their own learning” (Wenden, 1991, p. 25). These activities include planning, regulating, monitoring and modifying cognitive processes. The resource management category is a collection of strategies that involve the control of resources – time, effort, support.

Recently, Chamot et al. (1999) included these strategies and metacognition components in a “Metacognitive Model of Strategic Learning”. The learning strategies operate through the interaction of four processes of *Planning, Monitoring, Problem-solving* and *Evaluation*. This model is promoted as applicable for both learning the content and language effectively and independently.

The summary of these is shown in Figure 1.1.

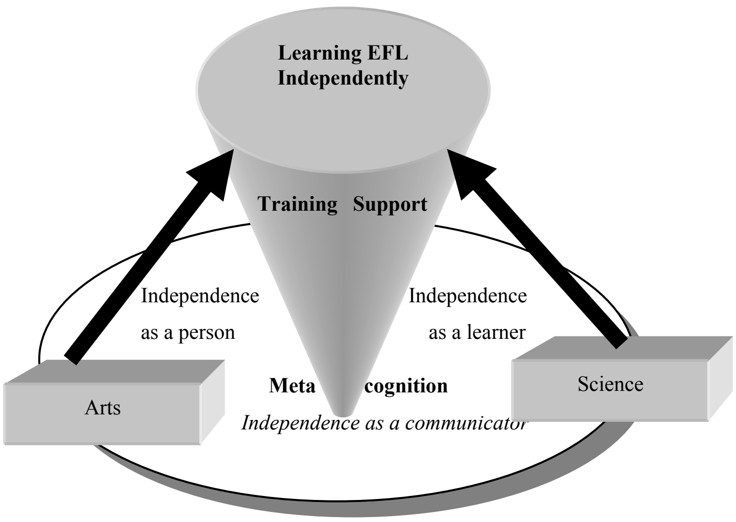

Figure 1.1 Concepts that underlie promoting learning EFL independently for learners from different disciplines based on Littlewood (1996).

1.2.2 Metacognition Theory & Language Learning Autonomy

Drawing the relevance of learning autonomy, metacognition theory and learning EFL and their interdependence into consideration, the conceptual framework for this study as shown in Figure 1.2 depicts learning through the interaction of existing metacognitive knowledge and metacognitive processes which are governed by the executive controller.

Existing metacognitive knowledge refers to the understandings of declarative, procedural and conditional knowledge, about the world, a person's cognitive and affective states and activities, tasks and strategies that are stored in one's long term memory. Thought processes at the cognitive level involve the knowledge and strategies required to achieve the cognitive goals such as tackling a task or a problem. Affective states and activities are concerned with emotions, attitudes and the beliefs a person holds and how they respond to situations. Metacognitive thought processes are those directed at strategy acquisition and governing the knowledge and strategies represented in long term memory and in cognitive thought as well as in the external situation, in this case the task/problem. They include monitoring, evaluating, problem-solving and planning processes.

The executive controller is the voice of a person's mind. It functions as a retriever of information to which monitoring or evaluating processes correspond and as a commander of those processes. That is, information gained will be selected, compared and combined, or discarded. The command for further information can be done where necessary. Consequently, this mental device makes final decisions about the knowledge and strategies to complete a task, to give it up, to solve a problem, or what to be discarded and what to be stored in long-term memory or to modify what is known. The executive controller tells one whether the task is too difficult or easy. It tells one how to deal with a task or a problem. It commands one to put in more effort or to give up. Furthermore, it makes decisions and orders other processes. The activation or inactivation of the executive controller indicates to what extent metacognitive engagement occurs.

The dynamic of the executive metacognitive process in Figure 1.2 can occur at any time before, during or after completing a task. The two-headed arrows indicate the generating of metacognitive processes and the corresponding information retrieval. The one-headed arrow represents the regulation of one process over another.

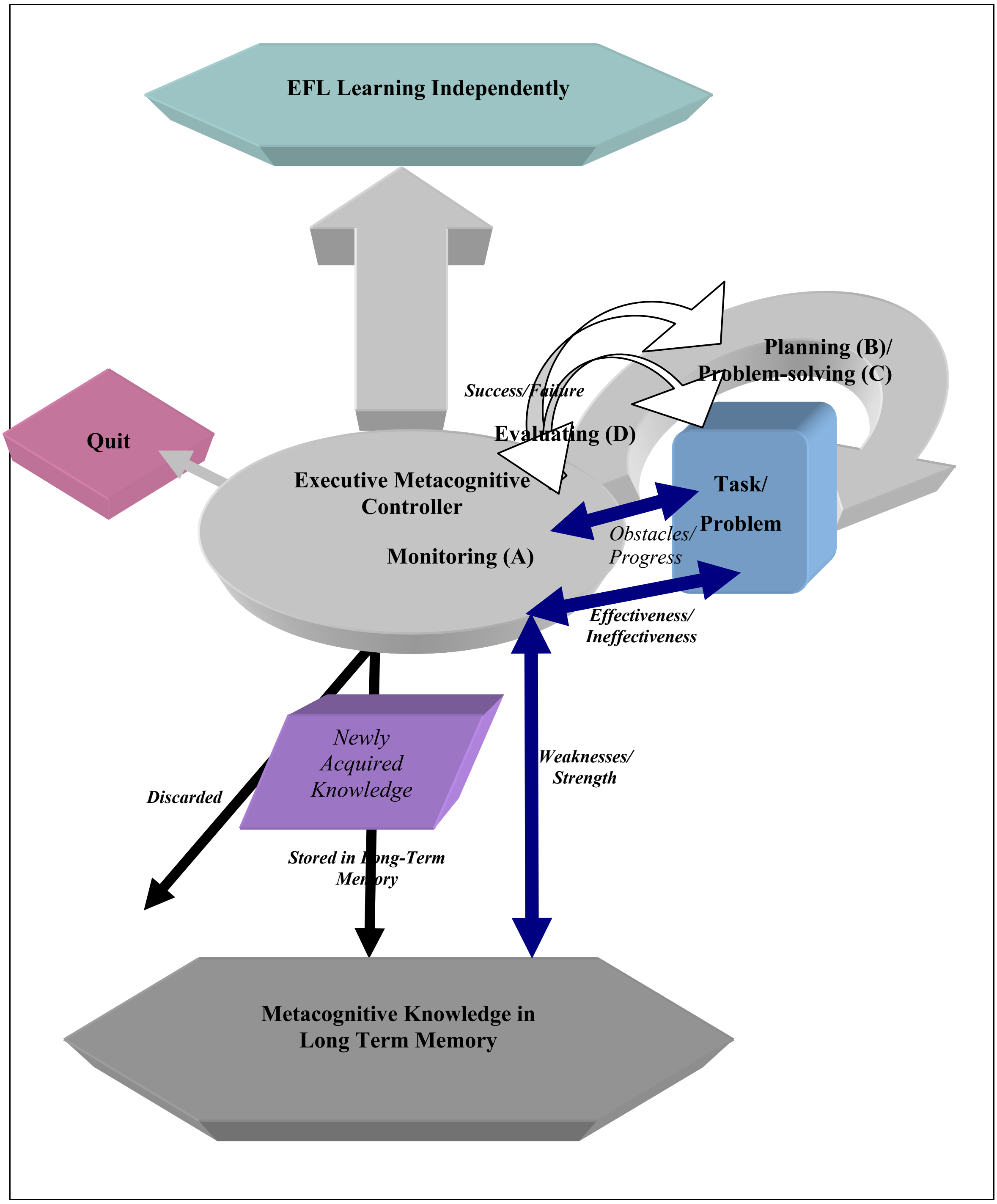

Figure 1.2 The interaction of metacognitive knowledge and control and regulation in promoting EFL learning independently.

Before undertaking a task, the executive controller requires monitoring processes (A) to check existing metacognitive knowledge in long term memory and the task/problem. The information from the monitoring processes flows between the metacognitive level, existing metacognitive knowledge and the executive controller. The controller deals with the information and commands the consequences, which can be planning, problem-solving, evaluating, avoiding/discarding processes.

The planning processes (B) involve the determination of the strategies to complete the task and the allocation of resources (time and effort) to the current task and to setting the intensity or the speed at which one should work on the task (Flavell, 1987). Chamot et al (1999) names these mental activities "the metacognitive processes of planning" and suggests some helpful strategies. For instance, as people prepare to listen or read they can use goal-setting and selective attention or they can use organizational planning to plan the content and sequences of their composition in preparing to write.

During a task, the monitoring processes (A) involve those directed at the acquisition of information about the person's thinking process that helps to identify the type of task, for instance, to check on current progress; to evaluate progress; and to predict the outcome of that progress. When the executive controller retrieves, selects, and makes a choice, it orders the other processes (B and/or C) that help one regulate the course of one's own thinking. These other processes include reording the steps of the task and allocating resources to the task, for example, to set the intensity or the speed required to complete the task in time, to improve quality of the task or to work out the problem (Chamot, Barnhardt, El-Dinary, & Robbins, 1999).

At the completion of a task, evaluating processes (D) help to refine the final work and to judge the knowledge and ability gained from undertaking the task (Chamot, Barnhardt, El-Dinary, & Robbins, 1999). Such high level metacognitive engagement under executive control results in the determination of newly acquired knowledge including specific content, strategy, the likelihood of strategy transfer and the quality of self-understanding about the nature & function of mental processes.

When failures and limitations occur the controller is not activated while thought processes keep on working (Kendler, 1995; Otero, 1998). The absence of the controller can explain automatic thoughts and performances and a low level of metacognitive engagement. This causes obstacles in cognitive development and poor learning (Davidson & Sternberg, 1998; Dominowski, 1998; Koriat, 2002).

The model supplies further reasons for limitations and failure in learning. Inadequate or a lack of existing metacognitive knowledge affects the standard of evaluation. It can cause domino damage, one damage after another, that results in poor or inaccurate learning (Davidson & Sternberg, 1998; Dominowski, 1998).

Such damage might be because of beliefs that effect metacognitive judgments (Mazzoni & Kirsch, 2002; Perfect, 2002). False beliefs or insufficient declarative domain-specific knowledge, or unfamiliarity with a hands-on task, create ineffective standards required for making a decision. Schneider and Lockl (2002) argue that, in a familiar situation, even young children's predictions tend to be accurate. The deviant standard makes one fail to detect problems as they occur and prevents one from learning incoming information that contradicts what is held. This is the reason Otero (1998) provides for why some of students fail to detect any problem in the text reading and why they have a problem with the evaluation of their comprehension. He concludes that this is because of the inadequate standards they use in monitoring their comprehension. He notes another important reason, which is the standards they do not follow.

In the light of familiarity and accessibility, Koriat and Levy-Sadot (2002) find that accessibility occurs only when familiarity is high enough to drive the interrogation of memory for potential answers. The ineffective use or the absence of monitoring processes can impair one's success by leading to inappropriate regulation processes and brings about inactive planning, ineffective problem solving and unsatisfactory performance. Consequently one lacks the self-efficacy, interest and intrinsic motivation that are the potential factors for success.

Incorrect beliefs people hold, a lack of and/or an inability to exploit cognitive and metacognitive strategies eventually result in "illusions" (Koriat, 2002, p. 273). "Illusions" are misunderstood knowledge that will be stored in one's working or long-term memory waiting to be transferred to other tasks. They, in turn, lead to false beliefs, inadequate knowledge, and other inappropriate regulation processes.

In order to encourage learning, therefore, the investigation of learners' existing metacognitive knowledge has merit.

1.2.3 Listening, Reading Skills and Metacognitive Strategies

Listening and reading are fundamental skills for independent language learning, in particular for learners of English in Thailand. The advanced technology provides opportunities to access English, but teaching and learning has struggled to change from traditional methods to methods that endow students with effective ways to make use of resources outside the classroom. The limited number of study units available to non-English major students as well as teaching through the medium of the Thai language worsen the situation. Attempts to promote learning autonomy have therefore not been satisfactory in Thailand. Further research in developing learners' ability to listen and read in English is required. Because metacognitive strategies seem to be general to tasks in both L1 and L2, helping Thai learners to be able to cope with listening and reading in a FL is presumably achievable.

According to Chamot and colleagues (Chamot, Barnhardt, El-Dinary, & Robbins, 1999; Chamot & O'Malley, 1987; O'Malley, Chamot, Stewner-Manzanares, Russo, & Kupper, 1985), language learning strategies and strategies for learning content are similar. "The strategies such as selective attention, self monitoring and self-evaluation can be used with every type of learning task" (Chamot & O'Malley, 1987, p. 242). Other empirical evidence reveals that comprehending L1 and L2 involves the same strategies regardless of modes, i.e., listening and reading. Similar strategies, such as "translation, summarizing, self-evaluation, self-monitoring inferencing, elaboration and deduction" are used to overcome reading comprehension problems in both in L1 and the FL (Chamot & Kupper, 1989, p. 17). In listening to L1 and also to L2, listeners use existent knowledge about the world, situations, human interaction, words, syntax and grammar to comprehend what they hear (Rubin, 1994). Moreover, L1 and L2 learners share difficulty with phonological processing because of the absence or ineffectiveness of cognitive processing both in reading and listening (Sparks & Ganschow, 1993).

There is some evidence which shows that metacognition is unique to a specific domain or task, but it is not strong (see Davidson & Sternberg, 1998; O'Malley, Chamot, Stewner-Manzanares, Russo et al., 1985). For instance, there is a discrepancy in the frequency of use rather than in the type of strategies. Even translation, which would appear to be specific to L2 tasks, is extensively used in math problems. However, it remains unclear what metacognitive strategies Thai learners possess and use effectively when reading and listening in either the major subject content or English.

1.3 ORGANISATION OF THE THESIS

This chapter has introduced the study, a background to the study, the significance of the study, its purposes and research questions. Finally, the rationale for the study is described.

A literature review in the second chapter discusses learning autonomy and FL/SL learning, teaching learning English language in the Thai tertiary context, metacognition and metacognitive strategies.

Chapter 3 contains a detailed description of the design of the study. The methodology covers the approaches used in finding out answers to the research questions, examples of metacognitive strategies for listening and reading tasks in both L1 and L2, details of participants, data collection and data analysis.

The findings from the interviews, the questionnaires and the self reports in terms of perceptions of relevance, use by students, incorporation in teaching and the relationship between perceptions and actual use in learning or teaching are presented in chapters 4 to 8.

Chapter 9 includes a synthesis of the findings to answer questions posed in chapter one. The metacognitive strategy list(s) are derived from the findings for Agricultural Science students and Communication Arts students in order to promote their autonomy in learning English.

A summary of the study is provided in chapter 10. The chapter concludes with a discussion of limitations of the study and recommendations for teaching and learning autonomy as well as for further research.

2. LITERATURE REVIEW

OVERVIEW OF THE CHAPTER

Previous studies and literature relating to independent learning, language learning, and metacognition are discussed in separate sections in this chapter. Initially, the way that learning autonomy and learning a foreign or second language correlate are presented. Next, the relationship between learning English at the Thai tertiary level and independent learning is scrutinized. Then, metacognition and learning across the curriculum are discussed. Finally, there is discussion of how to access internal processes such as metacognitive knowledge, its control, regulation and use.

2.1 LEARNING AUTONOMY & FOREIGN/SECOND LANGUAGE LEARNING

2.1.1 Learning Autonomy & its Significance

Definitions of independent learning or learning autonomy posited by many educators such as Littlewood (1996), Sheerin (1997) and Wenden (1991) focus on learners' willingness and ability to take responsibility for their own learning and to develop effective learning strategies. Littlewood (1996) elaborates his view through three kinds of automomy which include autonomy as a person, as a communicator and as a learner. According to Littlewood, autonomy as a communicator and as a learner charaterise autonomy as a person. Autonomy as a communicator engages the ability to use language creatively and to use appropriate strategies for communicating in specific situations. Autonomy as a learner involves the capability to employ independent tasks and to use appropriate learning strategies across the curriculum.

The responsibility that independent learners assume involves "determining the objectives, defining the contents and progressions, selecting methods and techniques to be used, monitoring the procedure of acquisition and evaluating what has been acquired" (Little, 1991, p. 7). These responsibilities are also reflected in the characteristics of independent learners (Purdie et al., 1996). According to Purdie, Hattie and Douglas, autonomous learners are "purposeful, strategic, and persistent in their learning" (p. 87). They have the ability to evaluate their own progress in line with the goals they have set and to refine subsequent behaviour in the light of that self-evaluation. They are self-initiators, that is, they generate and direct their own learning experience. In addition, independent learners are likely to have more adaptive cognition and motivation (Schunk & Zimmerman, 1994).

Little (1991) also claims that the responsibility that independent learners assume involves two skills. The first is planning such as determining the objectives, defining the contents and progressions, and selecting methods and techniques. The second is monitoring progress which involves checking on-going learning and assessing the knowledge learnt. The ability to evaluate one's own progress in accordance with the set goals and to refine subsequent behaviour in the light of that self-evaluation is essential (Little, 1991).

To promote learning autonomy in response to the above definition and responsibilities, two prominent sets of variables are involved, i.e., learning and environment. The first of these, the learner variables, involve existing knowledge, motivation and metacognitive engagement (Dole & Sinatra, 1998). Littlewood (1996) describes learners' existing knowledge as willingness, ability and conceptions. He further proposes that ability covers knowledge about alternatives and the necessary skills to select among these choices. Willingness implies reliance upon motivation and confidence to take responsibility for the appropriate choice (p.428).

Littlewood (1996) contends that when students enter university they conform to their views of learning through what they have experienced since birth. These conceptions can either foster or impair the development of autonomous learning. Similarly, Leki (1995) concludes that students from different disciplines, i.e., Audiology and Speech Pathology, Education and Political Science can transfer their prior learned strategies to learning EFL. Her subjects came to university with varying levels of knowledge in strategy use. Leki found that all students shifted or maintained their strategies to suit their needs. Her students were all flexible and rich in ideas about what to do in learning EFL.

With regard to motivation, Zimmerman (1995) points out that motivation-related contexts affect self-regulation of effort, self-efficacy, persistence and also task choice. This suggests that there is no clear distinction between the components. Littlewood (1996) also suggests that instructors should consider student's motivation, confidence and a systematic approach to familiarising students with the range of learning variables, e.g., existing knowledge and skills relevant to learning autonomy, to increase their ability and willingness to engage in independent learning. He suggests that these components go hand in hand in developing strategies for autonomy. Therefore, the interaction between metacognitive knowledge and the regulation of that knowledge enhances motivation and vice versa. Based on this interaction, independent learning is possible if learners have a strong capacity to transfer acquired knowledge to new situations either in the same subject area or other fields. Miserandino (1996) supports the notion that students who have internal motivation engage in school work with more involvement, persistence, participation and curiosity. Conversely, when perceiving a lack of either competence or autonomy Miserandino's students showed less involvement and persistence in learning, more avoidance and ignoring behaviours evidence of boredom and a lack of curiosity (p. 208).

These findings suggest that metacognitive engagement helps individuals to judge whether they have sufficient knowledge and ability to undertake a task and to decide how to handle it. This self-capability belief or self-efficacy encourages confidence and the willingness to handle an activity and to maintain that effort. The more confidence students have, the more motivated they are. This is supported by Oxford, Park-oh, Ito & Sumrall (1993) who claim that the more motivated students are, the more frequently they use learning strategies and vice versa.

After completing a task, metacognitive engagement helps the individual to decide whether the message/knowledge/learning was appropriate and whether it should be linked to existing or stored knowledge for future use or whether it should be discarded. Successful high level metacognitive engagement occurs with the retention of relevant messages/knowledge and this enhances the possibility of transfer of learning across content domains (Dole & Sinatra, 1998). Georghiades (2000) agrees that independent learning is possible if learners have a strong capacity to transfer their acquired knowledge to new situations either in the same subject area or across fields. Since this acquired knowledge has been deliberately and repeatedly used and proven relevant, learners should be familiar with it and it should be easy to access (Reder & Schunn, 1996).

Although these scholars emphasise the effectiveness of metacognition they accept either explicitly (Georghiades, 2000) or implicitly (for example, Miserandino, 1996; Reder & Schunn, 1996) that to enhance a learner's sense of responsibility for his/her own learning takes time.

The second prominent set of variables which affect learner autonomy are those clarified as environmental contexts. However, there has been little research in this area. The environmental contexts that affect learning autonomy range from the micro level such as text effects (Dole & Sinatra, 1998; Rubin, 1994) to the macro level such as the classroom and institution (Littlewood, 1996). Garner's (1990) theory of settings stresses the influence of both levels. She posits that children's and adults' use of strategies can be affected by these contexts. The contextual factors that obstruct the use of strategies include inappropriate lessons (i.e., those with minimal transfer); and learning goals that do not support strategy use or understanding the link between strategy use and task demands; strategies that are too closely linked to particular situations; and classroom settings that do not support strategy use.

Overall, experts stress the importance of learner variables. Therefore, there is considerable consensus in the literature that enhancement of the transfer of learning acquired in school settings to other contexts within and across disciplines and to wider social contexts can be achieved by encouraging the learners' sense of responsibility. However, investigating learners' understanding and use of strategies and providing opportunities to prove the success of those strategies takes time. Thus the study of learners' perceptions, the interaction between these perceptions and actual behaviours, as well as their transfer to further learning situations (as done in this research) merits further attention.

2.1.2 Learning foreign/second language independently

Learning autonomy is claimed to be the ultimate goal of education, as well as a goal of language learning. As Benson (2001, p. 1) reasons, through the process of helping them to be autonomous, learners become "better language learners" and "develop into more responsible and critical members of communities in which they live". In addition, for the past two decades the characteristics of independence as communicators and as learners have been recognised as the characteristics of successful learners in FL/SL learning as well (Naiman, 1978; Rubin, 1981; Stern, 1975). Wenden (1991) describes autonomous or independent learners as those who possess metacognitive knowledge about learning, about their own cognitive and affective traits. They will also understand learning strategies and their use:

> …'successful', 'expert', or 'intelligent' learners have learned how to learn. They have acquired the learning strategies, the knowledge about learning, and the attitudes that enable them to use these skills and knowledge confidently, flexibly, appropriately and independently of a teacher. Therefore, they are autonomous (p. 15).

This is confirmed by Fleming & Walls (1998). They reveal that good language learners take active responsibility for their own learning and use a range of strategies that enable them to plan, monitor, manage and reflect on the process of learning a second/foreign language. They also claim that metacognitive strategies are closely linked to the development of learning autonomy.

The need to give students training in the use of strategies for learning language independently is proposed by McDevitt (1997). In her review of a programme of language awareness and study skills at the Self-Access Language Learning Centre (SALLC) University of Aberty, Dundee, McDevitt (1997) reported that, over the first year, the programme showed only limited success. The subjects, first year students of French on a Business Management course, were not motivated to attend compulsory tutorials and made little or no use of the facility. On the other hand, students who made good use of the centre had greater learner autonomy and could be encouraged to undertake self-directed study.

Independent learners in language learning, according to other scholars, use metacognitive strategies prominently. Oxford, Park-Oh, Ito and Sumrall (1993), for instance, investigated factors influencing achievement in learning Japanese as a foreign language in distance learning programs where learners actively managed their own learning. They found that cognitive, metacognitive and compensation strategies were frequently used. Similarly, White (1995) found that university distance learners who enrolled in either French or Japanese reported use of metacognitive strategies more frequently than classroom learners who reported use of cognitive strategies more frequently[1]. Vanijdee (2004), on the other hand, found greater use of cognitive strategies than metacognitive and social-affective strategies in a distance EFL learning programme by Thai undergraduate learners. Nonetheless, she found the strong relationship between cognitive and metacognitive strategies that implies the crucial role for metacognitive strategies in distance language learning.

Similarly, studies on the achievement of learning a foreign/second language point to the key role of metacognitive strategies in every skill. Vogely (1995) reports a dramatically increased use of metacognitive strategies by subjects with higher levels of listening proficiency after having been trained in learning strategies. Schoonen, Hulstijn and Bossers (1998) observed with reading comprehension that students who had acquired metacognitive knowledge performed better than those who had not. Similarly, Robbins (1996) reports positive results on metacognitive processes when providing training to first year students at a university in Japan. Encouraging results of training students to use metacognitive strategies when listening to lectures and speaking have also been documented by others (O'Malley, Chamot, Stewner-Manzanares, Russo et al., 1985). In addition, Kasper (1997) reports a significant relationship between metacognition and ESL writing performance, and particularly that strategy knowledge which increases significantly as students become more proficient in the target language.

Again, independence in language learning points to the key function of metacognitive knowledge and metacognitive strategies: the learner variables described in the previous section. This study focuses on the arguments of Littlewood (1996), Georghiades (2000) and Zimmerman (1995) and particularly the components of existing knowledge, the self-regulation of previous knowledge and its transfer to new learning contexts.

2.2 TEACHING AND LEARNING ENGLISH AT THE THAI TERTIARY LEVEL

2.2.1 Promoting Learning English Independently

Endowing learners with the ability and capacity to take charge of their own learning has been the ultimate goal of teaching and learning at a tertiary level in Thailand for some time. Recently, the National Education Act 1999 (Office of the National Education Commission, 1999) emphasised the characteristics of the ideal citizen as having high morality, discipline and

[1] The strategy classification proposed by O' Malley and Chamot (1990, pp. 137-139).

purpose, and being strategic, critical, responsible and adaptive and responsive to the local and global community. The human resource development highlighted for the sustainable development of Thailand, is also in the Ninth National Economic and Social Development Plan 2002-2006 (Office of the National Economic and Social Development Board, 2000). The Act itself requires students graduating from tertiary institution to be skillful in using computers and in a foreign language in order to access and use world wide information. This makes English the most important foreign language in the Thai academic curriculum.

However, studies of the levels of English skills of Thai students at high schools and the tertiary level reveal that the desired level of proficiency in every skill has not been met (Angwattanakul, 1987; Sukamolson, 1989; Wongsothorn, 2004). The focus on memorizing is reported to be the cause of the unsatisfactory achievement in higher education by Office of the National Economic and Social Development Board (2000). The traditional teacher-controlled curriculum still overrides the teaching and learning process in schools and universities. Teachers and lecturers transfer knowledge and experiences to students with the aim of helping them pass examinations. The core roles of students are merely listening and taking notes and it is perceived that all information in lectures addresses examination questions (Office of the National Economic and Social Development Board, 2000).

The pressure to change the teaching and learning of English in universities is revealed by many studies. For instance, Pradupongse (2004) and Wiriyachitra and Keyuravong (2002) argue that the current English language curriculum at tertiary level does not meet the requirements of the workplace. Most learners stress that they want to be skillful in listening and reading skills in order to attend lectures/meetings, make presentations, and handle negotiations (Westerfield, 1999, pp. 2-3). Other studies report that English reading and listening are highly relevant and are frequently used skills in most careers (Chandavimol, Kromkool, & Twitchartwittayakul, 2004; Pradubpongse, 2004; Sangnark, 1993), and are the most needed skills (Prapphal, 1998; Sangnark, 1993; Tze Khoong, 1998).

These inadequacies are not surprising given a limited number of units available in English. Only a few English units are compulsory for students in other content domains at most universities, including regional Rajabhat universities. Moreover, insufficient and inadequate practice results in poor skills.

Mostly, listening is treated as a minor skill. It is either embedded in teaching conversation skills or included as an introduction to teach other skills such as reading or writing. Generally, instruction in reading English involves teaching grammatical structures and vocabulary, assigning a text to be read and answering a series of comprehension questions (Chandavimol, 1998; Naranunn, 1998; Waugh, Bowering, & Torok, 2005a, 2005b) while any transformation of effective strategies for learners has been minimal (Suriyamanee, 1993). Other inadequacies are reflected by Chandavimol (1998):

> …The texts that are used in Thai schools often have little or no connection to what the student does in his or her everyday life, what he or she sees on television or reads about in magazines and newspaper, and to what is genuinely important and interesting. English reading comprehension in Thailand has generally been based on the system of translating each sentence, word by word, into Thai rather than trying to read it as an English sentence, thinking about its meaning and evaluating its relationship to other sentences. Thai teachers too often use Thai throughout a lesson instead of using English. They explain everything and the students are merely passive observers (pp. 31-32).

Katib (1997) confirms that translation is entrenched in the teaching of reading in Thailand. She found that translation was a prominent reading strategy among her undergraduate subjects. Moreover, she notes that English is a foreign language in Thailand and exposure to it is often limited to academic settings.

Such traditional teaching focuses heavily on language features; it is laborious for learners and creates obstacles for promoting learning autonomy. It wastefully discards opportunities for learners to enhance their sense of responsibility and to adopt effective tools for taking charge of their own learning.

2.2.2 Readiness of Thai learners

Given the potential for learner variables to impact on learning autonomy, the question is raised here as to what extent Thai learners have been prepared, in terms of their cognitive and affective states, for taking responsibility in learning English independently.

Although Littlewood (1999, p. 86) hypothesizes that "the Asian students are seen as ambitious to achieve and prepared to put a lot of effort into their learning", the readiness of Thai learners to become autonomous learners is questionable. For example, Wasanasomsithi (2003) reports that learning independently is the least preferred option of first year undergraduate students in either the Sciences or non-Sciences at a Thai university. This agrees with a previous study by Soinam (1999) in which students at post secondary school level in Industrial Trades had only moderately positive attitudes towards autonomous English language learning. In addition, Prapphal (1998), in attempting to introduce self-directed learning through the Internet and Intranet pedagogy for language teachers, reports that only a marginal number (3 per cent) of her subjects reported using a computer to practise English independently. There was no response on individual work, but the majority (66 per cent) preferred group work.

Autonomous learning requires a degree of self-confidence, however, showing too much confidence is unacceptable in Thai culture. Moreover, the Thai value of high self-defensiveness makes learners keep quiet, reluctant to give response to questions, reluctant to express their lack of comprehension or to ask for clarification or help. This is consistent with Littlewood (1999, pp. 84-86) who asserts that East Asian students see themselves as interdependent rather independent. They are likely to engage in cooperative learning and help and support each other and to hold perceptions of the teacher as an authority figure who is in charge of transmitting knowledge. This hampers learners in taking responsibility for their own learning and results in limited opportunities to practise many of the skills that would enhance their ability to accomplish learning tasks independently. For example, teacher-centred English classes that focus on accuracy rather than fluency suppress students' self-esteem and confidence (Littlewood, 1999). Therefore, most come to their English class with the perception that they are poor in English and are unable to cope with an English task alone.

McInerney, McInerney and Marsh (1997) report that cooperative settings provide good opportunities for monitoring and regulating one's own understanding of skills and concepts. They conclude that the inclusion of metacognitive components in cooperative learning tasks significantly enhances learners' cognitive and affective ability, their self-esteem, self-concept and their sense of personal autonomy. Moreover, this is the case, "for those with feelings of embarrassment about making mistakes in public, or those with initially high levels of anxiety" (p. 692).

A small number of studies have been carried out on how Thai EFL learners approach learning at tertiary level. Vanijdee (2004) used questionnaires, think-aloud protocols and in-depth interviews to examine learning strategies used by Thai distance undergraduate learners. Patterns of strategy use by these subjects varied and included a combination of cognitive, metacognitive and socio-affective strategies. Only 8 per cent of subjects (N = 391) used all three types of categories frequently. A large proportion of participants (44 per cent) reported low use of these strategies.

Ratanapinyopong (2002) investigated undergraduates' use of problem-solving strategies in reading. The interviews were conducted with four third-year English major students at a private university, two with the highest scores in an analytical reading test (18/30) and two with the lowest scores (7/30). She found that all participants perceived that they had vocabulary problems, both in spelling and in lexical choices. The poor students also had a serious problem with grammatical structures. The successful students used reading strategies, i.e., skimming, knowledge about the task requirement, and appropriately organising ideas gained from reading. Although the less successful students also used skimming in an effective way, they showed an absence of an effective strategy repertoire which would include judgment of the difficulty (of questions), being unable to organise ideas gained from the reading, and using rereading strategies when they did not comprehend a text.

Even fewer scholars have conducted research on the perceptions of students. Mahattanaporn (2002, pp. 43-45) conducted a trial of graduate attributes and found that informants including lecturers, employers and graduates rated the graduates' foreign language skills, ability in learning autonomously and problem-solving skills at a low level. More recently, Intaraprasert (2004) has used questionnaires to examine unsuccessful learners' use of classroom-related strategies and their perceptions of the usefulness of language learning strategies. Subjects were 193 first year undergraduate students taking English as one of their introductory courses at a university in Thailand. Although these unsuccessful language learners perceived most of the proposed classroom-related strategies (28 out of the 29 strategies) as very helpful in enhancing their language learning in or outside the classroom, the ratings of use were low. Only 12 strategies were reported used by more than half the students. The three strategies perceived as most relevant included attending classes regularly, listening to teachers attentively and thinking to oneself while studying. The least likely strategies to be seen as relevant were trying to avoid being distracted while studying and trying to interact with the teacher outside the class time.

Clearly these results are still inconclusive suggesting the need for further research on how Thai students' cognitive and affective states affect their approach to learning English.

2.2.3 Attempts at Enhancing Independent Learning

Numerous attempts to enhance independent learning among Thai students have been made at every educational level (see for example Khamchotirot, 2000; Kornkaew, 2000). These include studies on the instruction of language features and language learning strategies, students' use of learning strategies and the implementation of useful teaching techniques or instruments.

Effective ways and tasks for promoting positive attitudes, self-confidence, sense of responsibility, the acquisition of language features as well as learning behaviours have been studied and introduced into classroom practice. For instance, the successful implementation of approaches such as the genre-based rhetorical approach and the cooperative learning method in teaching English reading comprehension for elementary students in provincial schools is evident (Waugh, Bowering, & Chayarathee, 2005; Waugh, Bowering et al., 2005b). An attempt to develop reciprocal lessons for enhancing English reading comprehension and ability in using comprehension monitoring strategies has also been carried out among secondary school students (Paramesa, 1997). Results showed that subjects significantly improved their reading comprehension, attitudes and behaviours towards learning English as a result of the intervention.

Attempts to endow learners with the ability to learn independently have also been launched at the secondary and post secondary level, for instance, English project work lessons (Suriya, 1999) involving directed reading-thinking activities to develop reading comprehension and comprehension monitoring (Siripong, 1998). Self-questioning & note taking strategies for reading comprehension (Chanklin, 2001) and cognitive strategies for English listening comprehension (Suwaparp, 1998) have also been explored and implemented to English teaching practice.

In order to motivate learners' responsibility, many teaching instruments and materials have been developed. These materials have included supplementary materials for hotel and tourism (Wiriyakul, 1998), electronic instruments such as videotapes with subtitles for enhancing listening (Chachoomwong, 2000), and computer assisted language learning (see for example Jatejumlong, 2004; Kajornboon, 2004; Prapphal, 1998). In addition, self-access centres with resources for encouraging independent learning have been established in most secondary schools and in all universities.

Even though these empirical studies show satisfactory results and some have been introduced to English teachers in both primary and secondary schools, very few English lecturers at the tertiary level have been involved. In addition, these studies have not addressed learners' metacognitive conceptions and experiences. This area still needs more investigation.

2.3 METACOGNITION THEORY

2.3.1 Metacognition: Definition & Components

Flavell' s Taxonomy of Metacognition (Flavell, 1971, 1976, 1979, 1981) prompted widespread controversy in early psychological research. The initial studies conducted within the framework of cognitive and developmental psychology (see Son & Schwartz, 2002) have provided the stepping stones for further research in social-cognitive and educational psychology. Subsequent attempts to clarify the fuzzy, vague and imprecise character of the concept of metacognition have borne fruit, and the problems in exploiting metacognition have been reduced. There have been numerous instances of successful applications across a range of domains such as disc moving, card, statistical, mathematical, physics and science problem solving (Dominowski, 1998), which Zimmerman (1998, pp. 75-79) describes as, "not only in academic but also in professional areas". Since the 1970s & 1980s the understanding of the elements of metacognition has made substantial progress. It is now over three decades since the term was first introduced and contributions from various researchers have delineated the concepts of metacognition and metacognition theory.

Metacognition is viewed as the higher level of mental processes that one learns and uses to control one's thoughts or knowledge. According to Flavell (1987, p. 2), it comprises both metacognitive knowledge and metacognitive experiences. Metacognitive knowledge is about "anything cognitive" and "anything psychological". It involves an awareness of one's knowing about cognitive states and activities, and affective states, and control over this knowledge in order to achieve a specific goal. This knowledge is referred to as "declarative knowledge" "procedural knowledge" and "conditional knowledge" (Kluwe, 1987, p. 31). Declarative knowledge involves knowledge of 'what' one knows about cognitive states and activities (Brown, 1987) and affective states (Flavell, 1987). Cognitive states and activities involve knowledge of the world, understanding of one's own knowledge and capabilities and knowledge of strategy. Affective states concern knowledge of emotions, attitudes and motivation and this is an inherent characteristic of the learner. Procedural knowledge refers to knowledge of 'how' to use world, personal and strategic knowledge. Conditional knowledge refers to 'when' to apply this knowledge and 'why' one should apply it. This knowledge also includes how to evaluate the effectiveness of knowledge application. Kluwe (1982, p. 212) refers to metacognitive procedural knowledge or executive processes which are those that monitor selection and application, as well as regulate activities for solving problems. These processes involve both monitoring and directing other thought processes (Hacker, 1998a). The mechanism of these processes will be discussed later in this chapter.

Metacognitive experiences are concerned with awareness of one's own cognitive and affective processes (Flavell, 1979). Metacognitive experiences are retrieved by active monitoring of one's own mental processes. These experiences can bring about change in one's thought processes in that they can be integrated into, discarded from, or used to justify one's current metacognitive knowledge. Consequently, "they can cause one to change goals" (Hacker, 1998b, p. 168), and "to make decisions about how much further processing is necessary to achieve the goals" (Flavell, 1976, p. 252) and change future performance (Mazzonio & Nelson, 1998).

Hacker (1998a) makes the difference between metacognitive knowledge and metacognitive experiences explicit in his conclusion.

> A definition of metacognition should include at least these notions: knowledge of one's knowledge, [thought] processes, cognitive & affective states and the ability to consciously and deliberately monitor and regulate one's knowledge, [thought] processes and cognitive and affective states (p. 11).

As such, the two components of metacognition involve knowledge and the ability to consciously access and regulate that knowledge. Three kinds of knowledge are prominent. Firstly, knowledge about the world. Secondly, knowledge of the person, which includes individual's cognitive and affective states and processes. Finally, there is knowledge about strategies or strategic knowledge.

2.3.2 Metacognition: Characteristics & Implications

The components of metacognition, e.g., the knowledge about cognitive monitoring and ability of cognitive regulation, were originally examined separately (Brown, 1987; Hacker, 1998a; Schwartz & Perfect, 2002). The former has been at the centre of cognitive research since 1960s. Many descriptive and experimental studies of metacognition in this field focused on "aspects of memory" such as the ability to recall, the accuracy to make judgements about one's own memory, and more recently, "metamemory" (Schwartz & Perfect, 2002, pp. 2-4) and "metacomprehension" (Maki & Berry, 1984; Maki & McGuire, 2002). Developmentalists have been interested in metacomprehension for over four decades. These scholars emphasise the processes underlying monitoring and control, especially those concerning the operation of processes that direct other thought processes in information systems (Kluwe, 1987, p. 32). These studies have attempted to identify, through reflection on one's cognitive process, "components of metacognitive abilities" (Kluwe, 1987, p. 31), "their development with age, and the possibility [that] metacognitive knowledge, abilities and strategies contribute to cognitive progress" (Koriat, 2002, p. 263).

These studies suggest that knowledge about cognition is conscious and deliberate. It is controlled by the individual who is experiencing it as "statable" and "accessible" to others (Hacker, 1998a, p. 8; Zimmerman, 1998, pp. 79-80). Therefore, researchers can examine such knowledge by getting people to activate their thoughts and report them. In addition, metacognition can be studied in people from a wide range of age categories, from young to adult learners (see Dominowski, 1998). For example, "even kindergartners can accurately monitor their knowledge" (Hacker, 1998a, p. 12).

Differences in metacognition among females and males are not statistically significant (Oxford et al., 1993). For example, Carr and Jessup (Carr & Jessup, 1997) examined primary students' use of metacognition in solving mathematical problems. They found that both boys and girls were equal in the use of metacognitive knowledge. Similar indications are reported in high school learners by Purdie, Hattie and Douglas (Purdie et al., 1996) and in university learners by Nyikos, Oxford and colleagues (1993) respectively. In addition, as age increases so does the amount of knowledge stored in memory and accuracy in monitoring this knowledge, implying that the knowledge and metacognitive skills develop with age.

Some studies reveal that metacognitive knowledge is "fallible" (Brown, 1987, p. 67; Dunlosky, 1998; Hacker, 1998b). Adults as well as young children often misjudge their own ability relative to their actual performance (Benjamin, Bjork, & Schwartz, 1998; Koriat, 1995;

Simon & Bjork, 2001). A considerable number of studies have demonstrated the accuracy of people's ability to monitor and judge their knowledge before, during or immediately after study experimentation (for example Mazzoni & Nelson, 1995; Nelson & Narens, 1994; Thiede & Dunlosky, 1994). However, "such intermediate accurate judgments are far from perfect" (Son & Schwartz, 2002, p. 19). Students sometimes make overconfident judgments by overestimating their text comprehension performance (Glover, 1989), or have been inconsistent in eyewitness testimonies (Loftus & Zanni, 1975; Siegel & Loftus, 1978) and, worse, incorrect in predicting their future performance (Benjamin et al., 1998). In addition, it has been documented that undergraduates show both adequate and inadequate spontaneous beliefs about problem-solving methods (Antonietti et al., 2000). That is, while they can identify the critical features of problem-solving techniques and the abilities required by each technique, they possess faulty beliefs about the suitability of some techniques.

Metacognition is of such interest is because it plays an important role in learning. There are two roles that metacognition plays in learning, i.e., expertise in the subject matter and metacognitive activities (Winne & Hadwin, 1998). Scholars more extensively acknowledge the latter activities. Metacognitive knowledge and experience have also been found to be important indicators of success in learning across the curriculum (Davidson et al., 1994; Goh, 1997; Hacker, 1998b; McInerney et al., 1997; Oxford, 1990; White, 1995).

Successful FL/SL learners know how to plan, organize, focus, use many types of strategies to overcome difficulties and to evaluate their learning achivement (Chamot & Kupper, 1989; Green & Oxford, 1995; Hallbach, 2000; Oxford et al., 1990; Vandergrift, 1997; Vann & Abraham, 1990; Wenden, 1986). This is consistent with findings from outside the area of language learning. For instance, Davidson and Sternberg (1998) provide similar evidence in the domain of general problem solving, McInerney, McInerney and March (1997) in the domain of computer science, and Carr, Alexander and Folds-Bennett (1994) in mathematics.

Metacognitive knowledge and experience appear to play key roles in every human endeavour. However, one should be cautious about making judgments based on unclear knowledge. The reason is that incomplete or inaccurate knowledge may contaminate the standard of judgment. Also inaccurate or insufficient control and regulation of metacognitive engagement can lead to dissatisfactory results or failure. Pressley, Van Etten, Yokoi, Freeburn and Meter (1998) acknowledge that the more accurate one's metacognitive knowledge, the greater the success in learning. However, they do state that incomplete or inaccurate metacognitive declarative knowledge, or factual knowledge, often leads to incomplete or inaccurate encoding. This is manifested as either inaccuracy of monitoring and evaluating one's knowledge or the inability to access one's knowledge which causes 'domino damages' such as poor learning and poor performance (Davidson & Sternberg, 1998; Dominowski, 1998; Koriat, 2002). As a consequence, this can impair cognitive development or learning.

Incomplete or inaccurate metacognitive knowledge as well as inadequate standards used in comprehension monitoring (Otero, 1998, p. 146) often leads to incomplete or inaccurate encoding (Davidson & Sternberg, 1998, p. 49). On one hand, these may contribute to insufficient content knowledge, tasks or strategies, which may cause ineffective decision making (Koriat, 2002). On the other hand, they cause the learner to fail to detect problems as they occur and prevent them from learning incoming information that contradicts what is already in stored memory. Consequently, this results in inactive planning, ineffective problem solving and unsatisfactory performance that lead to lack of self-efficacy, interest and intrinsic motivation that are the potential factors for success.

Incorrect beliefs, the inability to exploit current knowledge and the lack of cognitive and metacognitive strategies eventually result in "illusions". What one thinks one knows turns out to be inaccurate (Koriat, 2002, p. 273). Such inadequate knowledge will be stored in working memory waiting to be transferred to other tasks. Illusions also lead to false beliefs and inadequate knowledge. This type of negative cycle causes the ineffective operation of metacognitive processes and should be of concern because it obstructs development.

Many scholars refer to the final learning condition as metacognitive engagement. Dole and Sinatra (1998), for instance, explain that the interrelation between high metacognitive engagement, existing knowledge, motivation and information is a key factor for conceptual change or learning. They question whether learning is achieved if "students are not involved in high engagement elaboration but in quick heuristic judgments that do not lead to strong and long-lasting change" (p. 125). When the performance of the activation of metacognitive processes reaches an individual's satisfactory level, that individual is likely to maintain the action and apply it to other tasks. This satisfies the condition of metacognitive engagement.

McWhirter, McWhirter, McWhirter & McWhirter (1998) refer to the degree of engagement as the distribution of awareness. In their view, the learners' academic success is due to the distribution of the awareness of procedural knowledge such as learning strategies and their potential for application. Such knowledge makes sufficient information available for a learner to "select the optimal strategy and modify it to meet the demands of a particular task, monitor performance and change the strategy if necessary" (see Son & Schwartz, 2002, p. 21). For example, when asked to skim information, younger children do not stress information/content words because they do not know which ones are the important ones yet. Older children who have learnt about the level of encoding more and less meaningful words will pay attention to the more meaningful words that describe the content (Paris & Byrnes, 1989).

Another advantage of metacognition is that metacognitive strategies can be used to work through any challenging tasks in any disciplines. According to Antonetti et al (2000), when students are faced with increasingly difficult psychological problem solving tasks, they tend to use metacognitive strategies to solve those tasks more than other types of strategies. However, Bacon (1992) and Vogely (1995) have found the opposite, that is, when faced with a more challenging task or listening comprehension, FL/SL students will use bottom-up strategies which require much less cognitive processing. It is unclear what causes these contradictory findings. It may be a discrepancy between language and non language tasks or something else. This area merits further investigation.

Finally, metacognition can be taught and transferred to other situations both within the same field and across content areas. The teaching of metacognition is widely documented (Dominowski, 1998; Hacker, 1998a; Zimmerman, 1998). For instance, in his review of the literature, Hacker (Hacker, 1998a) concludes that training in monitoring helps children. This is because when they choose a strategy and use it to explain their reasoning there is more metacognitive engagement. Their monitoring is also more effective. He further claims that teachers can introduce this awareness to students so that metacognitive activities will enhance their self-regulated learning. Hacker's claim is supported by Butler's (1998) achievements in training disabled adult learners in metacognitive stategies such as how to select, monitor, and apply their strategies.

Examples of transfer across domains are found in the area of language learning. For example, Leki (1995) interviewed first year ESL students in a U.S. university, observed them in the classroom and examined documents about what knowledge they brought with them and the strategies they developed in response to the writing demands they encountered in the regular courses across the curriculum. The participants were five students from different countries: Taiwan, France, Finland and China who had come to university with varying levels of background knowledge in strategy use. The students either shifted strategies or maintained them to suit their needs. They were all flexible and rich in ideas about what to do. Leki concludes therefore that students can transfer their prior learned strategies to learning EFL.

However, in spite of these findings, some investigations indicate that metacognition is not transferable. for example, Schoonen, Hulstijn and Bossers (1998) studied the application of metacognitive knowledge. They found that, while advanced learners spontaneously applied and transferred such knowledge in reading comprehension, some less advanced students were unable to do this.

Given the importance of metacognitive knowledge and metacognitive control and the mixed findings on the transfer of learning, it is appropriate to investigate this area further.

2.3.3 The Mechanism of Metacognitive Processes

Many attempts have been made to clarify metacognitive engagement. For instance, evidence from empirical studies in connection with the thought processes that direct other processes at lower cognitive level from cognitive psychology implies that the engagement level ranges from automatic to deliberate (Anderson cited in Chamot & O'Malley, 1987; Kendler, 1995). The information-processing model (Kendler, 1995) proposes two levels, lower and higher, within the information processing and the regulatory processing. The lower level operates unconsciously and the higher level operates deliberately.

The lower level in the information-processing model involves the encoding of all information automatically by the sensory system with little or no motivation involved. The activation of higher-level information processing is rapid and subject to familiarity and motives. Regulatory processing involves the capacity to select only relevant information for further processing and is deliberate. The lower level regulatory processing provides the capacity to modify behaviour and is likely to be automatic. It operates with little or no prior thought. The operation of the higher level regulatory processing deliberately seeks, examines and determines a workable solution (Kendler, 1995).

As described above, the existence of different of thought processes is congruent with Flavell's metacognitive experiences (1979), and with the arguments of Brown (1978), Brown & DeLoche (1978). and Hacker (Hacker, 1998b). Brown and DeLoache (1978) refer to the higher level of thought processing as the executive or monitoring component which directs the information processing system (Brown, 1978). That is, individuals organize and monitor their own thinking through the execution of metacognitive skills. In describing how thought processes at a higher level direct those at a lower level, Hacker (1998b) argues that a thought process at the metacognitive level treats those at the cognitive level as "the source of thought, whereas it is treated as the object of thought by the higher level" (p.169). Similarly, Flavell's metacognitive experiences indicate that there is a device or a process that controls that level of metacognitive engagement.

These different levels of metacognitive engagement can be seen from the fact that people sometimes automatically monitor, make decisions and respond to circumstances. Sometimes people perform or respond to a situation accurately and appropriately, but they cannot describe what they thought and why they did it. A study by Berry and Broadbent (1984) gives empirical evidence of this. They found that, even though subjects had learnt from trials and improved their performance, they were not able to answer questions adequately about doing the task. This indicates the activation of or engagement of a high level of metacognitive thought processes which have developed beyond consciousness to become automatic. On the other hand, in some circumstances where subjects deliberately controlled and regulated their behaviours, they had no problem in identifying their experiences, indicating that both cognitive and metacognitive processing were activated deliberately.

The interplay between metacognitive knowledge and the control of multidimensional thought processes is captured in Nelson and Narens' monitoring model (1990; 1994), in Hacker's (1998b) cognitive-metacognitive model of self-regulated comprehension, and in the Metacognitive Model of Strategic Learning proposed by Chamot, Barnhardt, El-Dinary and Robbins (1999). These models show higher level thinking processes as monitoring and controlling lower ones. That is, understanding at a metacognitive level can be used to regulate or modify thought at the cognitive level and, in turn, the information retrieved from the cognitive level can modify knowledge at the metacognitive level. This implies that the improvement of metacognitive engagement is cyclical or that those automatic engagements mentioned in the previous paragraph are distributed as a result of higher metacognitive engagement. However, this kind of automatic engagement differs from that which is distributed at the lower level of cognitive processing.

Several experts support the idea of two types of automatic thought processing. Kendler (1995) explains that thought processes at the cognitive level, which is a low level, involve the knowledge and strategies required for achieving cognitive goals such as tackling a task or a problem. Activating knowledge and strategies and decision-making processes at the lower level is rapid and likely to be automated because of the familiarity of this information (Brown, 1987). If there is uncertainty or difficulty, the operation of higher cognitive thought will be triggered (Kendler, 1995). The processes at the higher level are less automatic and are subject to delay because of accessing background knowledge in long-term memory (Kendler, 1995). In addition, Berry and Broadbent (1984; 1987) noted that, once the performance reaches the subjects' satisfactory level, they would continue at that level without further explanation and without overtly giving reasons.

Thus, processes at the metacognitive level that are activated deliberately can be developed to an automatic status after continued practice that has proved effective. Accuracy and efficiency seems to differentiate automatic activation at the higher and the lower levels. While the former provides highly effective and accurate information for decision-making, the latter tends to give less effective or far from perfect results. Therefore, automatic thought processing at metacognitive level is the ultimate academic goal.

Winne and Hadwin (1998) suggest interaction between these processes. That is metacognitive engagement may occur before, during or at the end of each state of an operation. So monitoring or evaluating may occur in the initial stage of learning, whereby one forms an awareness of that task, that is. At the next stage, goals are generated and strategies regulated that will help meet the goals.

The "recursive" nature of the interaction between the processes at the cognitive and metacognitive levels is corroborated by many experts (for example Brown, 1987, p. 67; Chamot, Barnhardt, El-Dinary, & Robbins, 1999, p. 12; Davidson & Sternberg, 1998, p. 54). An individual switches back and forth in the operation of thoughts between these processes. The monitoring and control processes and the regulation processes can occur before one is doing a task, during and/or after completing the task (Chamot, Barnhardt, El-Dinary, & Robbins, 1999; Davidson & Sternberg, 1998; Hacker, 1998b; Nelson & Narens, 1990, 1994; Otero, 1998; Son & Schwartz, 2002).

2.3.4 Metacognitive Strategies: Means to Control and Regulate Knowledge

Educational researchers differ on the number and names of the metacognitive processes. Metacognitive control is described as "metacognitive monitoring" (Nelson & Narens, 1990, 1994), "executive control" (Kluwe, 1987, p. 36) or "encoding" (Davidson & Sternberg, 1998, pp. 49-50), but the processes involved have similar functions. In line with Flavell (1979), Kluwe (1987) and Nelson and Narens (1990), metacognitive monitoring involves identifying the features of an ongoing cognitive and affective state or activity. That is, the process provides knowledge about the present state of cognitive endeavour and the transformation or maintenance or termination of one's own cognitive activities and states.

Monitoring is divided into a "metalevel" or where encoding is controlled and an "object level" where retrieval is controlled (Son & Schwartz, 2002, pp. 21-27). The object level is concerned with reflecting and assessing the external situation and storing these features in working memory. The metalevel, initially proposed by Nelson and Narens (1990; 1994), involves self-monitoring and self-regulation which covers planning, directing and evaluating one's behaviours. Davidson and Sternberg (1998) take a different angle and refer to the internal state as the retrieval of information stored in long term memory. It is a process of searching information relevant to that gained from current/working contexts (Son & Schwartz, 2002, pp. 27-31).

The process of metacognitive control involves monitoring and evaluation to retrieve information. Otero (1998) and Hacker (1998b, pp. 165-166) both agree that we use monitoring or evaluation as a means to observe, reflect on or experience our own cognitive and affective states and activities. They describe monitoring as assessing ongoing thoughts, and evaluation as searching and examining relevant knowledge stored in long term memory.

Cooper and Boyd (1996) refer to monitoring as executive monitoring. It involves four processes of recognising, analysing and synthesizing, and making connections and articulating learning. The first process involves recognising reasons and patterns to explain designs, data and problems. The second process involves asking questions that help to analyse and synthesise information or that help with probing, mapping, thinking and researching if the information is new. The third process makes connections, for instance, by comparing and contrasting. This means not taking things at face value, but considering different points of view, looking at things systematically, seeing interdependence, generalizing, personalizing and integrating new data into current understanding and practice. The last process concerns articulating one's learning in a precise and often concise way. It includes summarizing, paraphrasing, grasping the essence of an issue, illustrating and mapping ideas, putting a complex idea in lay terms, and being conscious of one's actions and how they reflect one's thinking at any given moment.

Nelson and Narens (1990, 1994) suggest that thought processes at the metalevel result in refining the object level of cognitive activities. Son and Schwartz (2002) show their agreement by stating that:

> metacognitive control can be exercised to toggle study tactics on and off, or editing may be done to adapt the conditions, operations or standards in cognitive structure that describe studying (p. 26).

Other experts agree that both monitoring and evaluation share a common function in receiving information retrieved from memory and external conditions (Flavell, 1979; Hacker, 1998b; Kluwe, 1987). They provide information for possible options for refinement of cognitive and affective states. The monitoring process informs the person of what is known, what is unknown, what is demanded by the task at hand, knowledge about the world, the standard for evaluation, and strategies relative to the current goal. Evaluation relies on "retrospection" and applying criteria (Kluwe, 1987, pp. 36-40) or standards for evaluation (Hacker, 1998b, pp. 169-171) to assess quality.

According to Kluwe (1987) and Cooper and Boyd (1996), metacognitive processes also act as synthesisers, analysers and connectors. These scholars emphasise high and low level thought processing at the metacognitive level. Low-level processes search the cognitive and affective states and external situations, while high-level processes analyse, synthesise, generalise and integrate the internal cognitive and affective states and/or external information and experience.

Information gained from monitoring and evaluating is a source for regulation processes. Kluwe (1987, pp. 32-46), Davidson and Sternberg (1998, pp. 54-55) and Borkowski, Carr, Rellinger & Pressley (1990, p. 54) elaborate further in that regulation processes help one make decisions based on the knowledge and strategies necessary for tackling a task or a problem. According to Kluwe (1987, p. 41-46) there are four types of regulatory decisions: "processing capacity", "what is processed", "processing intensity" and the "speed of information processing". Decisions on "processing capacity" involve attention, effort and capacity. The second type of decision, "what is processed", refers to the selection and analysis of a procedure.

Third, the "processing intensity" decision concerns "the frequency, the time allocation and the strategy shift or the modification" when carrying out a task. The fourth type of decision involves speed such as deciding to add certain cognitive operations or skipping some processing steps to complete a task.

Metacognitive control involves conscious and non-conscious regulation or decisions that people make in response to the outcomes of monitoring processes. Reder and Schuun (1996) claim that metacognition directs strategies that people use to solve problems or answer questions. However, Kluwe (1987) argues against this, noting that decisions merely determine how to solve a problem, not actually solve it. Such decisions therefore may not lead to a regulatory activity.

Many experts across different content areas have supported metacognitive control and regulation processes. Various terms, i.e., self-directed skills, or self-regulatory skills in the cognitive psychology, and different categories of such skills have been proposed. Zimmerman (1998), for example, advocates a cyclical self-regulatory process that involves self-evaluation and monitoring; goal setting and strategic planning; strategy implementation and monitoring and strategic outcome and monitoring. Hacker (1998a) categorises metacognitive processes into executive monitoring processes and executive regulation processes. The former involve decisions that help to identify a task; to check on current progress with the task; to evaluate that progress; and to predict the outcome of that progress. The latter, i.e., executive regulatory processes, direct a regulation of the course of one's own thinking. They involve decisions that help to allocate resources to the current task to determine the order of steps to be taken to complete the task, and to set the intensity or the speed at which to work on the task.

After a decade of continuing research, Chamot, Barnhardt, El-Dinary & Robbins (1999) advocate the Metacognitive Model of Strategic Learning. This model developed from an earlier conception including three metacognitive processes: planning, monitoring and evaluation (Chamot, 1993; Chamot, Dale, O'Malley, & Spanos, 1992; O'Malley & Chamot, 1990). Later in the model development, Chamot and colleagues (1999) provided four processes: planning, monitoring, problem-solving and evaluation. The model also indicates learning strategies, i.e., metacognitive, cognitive and social-affective, which have been effective in many learning tasks, including FL/SL learning and were categorised under each metacognitive process (Chamot, Barnhardt, El-Dinary, & Robbins, 1999).

The individual strategies of the Planning process therefore enable an individual to "organise a concept or principle or learning task in advance, preparing strategies for an upcoming task and making a plan for the parts, sequence, main ideas or language function to be used" (Chamot & Kupper, 1989, p. 15). These strategies are, for example, goal setting, choosing strategies for the task, making predictions, directing attention selectively, making a plan, activating background knowledge, pre-reviewing concepts and self-management (Chamot, Barnhardt, El-Dinary, & Robbins, 1999, pp. 18-22).

The Monitoring process involves “checking, verifying or correcting one’s comprehension or performance” (Chamot & Kupper, 1989, p. 15). Such strategies as comprehension checking, relating to background knowledge, checking progress, checking attention, checking strategy use (Chamot, Barnhardt, El-Dinary, & Robbins, 1999, pp. 21-24) and detecting mistakes (Chamot et al., 1992) are involved.

Strategies of the Problem-solving process include inferencing/elaboration, asking for clarification, trying out alternatives, accessing various resources, and working a problem out in a group and self-encouragement (Chamot, Barnhardt, El-Dinary, & Robbins, 1999, pp. 25-26).

Finally, Chamot et al’s Evaluating process involves considering the outcomes/success of the learning or performance and determining how successfully a plan is being executed “against an internal measure of completeness and accuracy” (Chamot & Kupper, 1989, p. 15). These strategies include checking whether the goal has been met, judging the correctness of predictions/guesses, judging how well the task has been accomplished, judging how much has been learned, assessing strategy use, summarising and self-assessment (Chamot, Barnhardt, El-Dinary, & Robbins, 1999, pp. 27-29).

Even though many studies report greater use of cognitive strategies, metacognitive strategies are widely recognised as the keys to success and as differentiating successful from less successful learners (Chamot, 1993; Chamot et al., 1992; Chamot & Kupper, 1989; Hallbach, 2000; Intaraprasert, 2004; O'Malley, Chamot, Stewner-Manzanares, Russo et al., 1985). For instance, Chamot et al (1992) report extraordinary results from training elementary and secondary ESL students in metacognitive awareness to facilitate their mathematics, word problem-solving and language through the CALLA model. A significantly greater ability to solve a problem correctly was found for students in classrooms where there was high implementation of the model than in low implementation classrooms.

Chamot et al (1992) also found a significant difference between students in the two implementation classes for the correct sequencing of problem solving steps. Moreover, the use of metacognitive strategies brought about significantly greater success. The most frequent use of metacognitive strategies was found among students with high maths ability. In support of this, Davidson and Sternberg (1998, p. 55) claim that less skilled problem solvers do not have the knowledge and processing resources required for extended global planning. They stress that good problem-solvers spend more time on planning and exercise more control over the planning process, while those with less expertise spend more time in attempting to implement a solution.

While metacognitive knowledge, metacognitive control and regulation are the keys to learning, they are not always activated. The absence or ineffectiveness of these processes results in poor learning or unsatisfactory improvement. Therefore, studying tertiary learners' metacognitive knowledge, that is, their ability to monitor their own cognitive and affective states and situations, their ability to synthesise and analyse information, and to connect and refine knowledge or experience is worthwhile.

2.4 METACOGNITIVE STRATEGIES: UNIVERSAL OR DOMAIN-SPECIFIC

2.4.1 L1 vs. L2 (FL/SL)

The idea that metacognition is common to learning across different areas is evident widely in the literature. For instance, it appeared in Chomsky's theory (1979) with respect to universal grammar in the form of underlying principles which children acquire naturally and which enable individuals to transfer their own grammar to any other language. Corder (1994) refers to this skill as interlanguage competence. It assists in the discovery of regularities in linguistic data. The interlanguage will change and develop as long as people continue to learn (Gass & Selinker, 1994). The Fillmore and Swain model (1984, as cited in O'Malley, Chamot, Stewner-Manzanares, Russo et al., 1985) implies that the conscious strategies which are effective in second language learning are common to those used with other first language tasks (p. 577). The Gernsbacher's (1990) Structure Building model presents persuasive empirical evidence that comprehending a narrative text, either in L1 or L2, involves the same structure-building skills regardless of modes, i.e., reading or listening.

Sparks and Ganschow (1993) provide convincing empirical support for shared underlying cognitive processing between L1 and FL reading and listening. In their view, poor L1 and FL learners have difficulty within phonological processing because of absent or ineffective cognitive processing of sound information. Phonological processing, according to Sparks and Ganschow (1993), involves skills in both phonology and phonological segmentation. The former is metacognitive knowledge, while the latter is a cognitive strategy that can be directed automatically or deliberately through metacognitive processes. The substantial results from Sparks and Ganschow's studies as well as their comprehensive literature review indicate that phonological processing problems are responsible for listening or reading comprehension problems in both L1 and FL.

Chamot and Kupper (1989, p. 17) show that Spanish-speaking students use similar strategies, such as translation, summarizing, self-evaluation, self-monitoring and overcoming comprehension breakdown with reading comprehension in the L1 (Spanish) and in the FL (English). The strategies commonly used by their participants in dealing with difficulties in L1 and FL reading included inferencing, elaborating or integrating new information with existing knowledge and deduction. Taking another angle, Walter (2004) claims that both L1 and L2 readers who fail even minimally to integrate new materials with their existing mental structures of the language during the early stages might be unable to create an efficient structure in the long term. The strategy of linking new knowledge to known knowledge is also common to listening in either L1 or L2. Rubin (1994) points out in her extensive and comprehensive literature review that L1 and L2 listeners relish being able to recognise existing knowledge about the world, situations, human interaction, words, syntax and grammar in what they hear.

Furthermore, Chamot and O' Malley (1987) posit that "strategies for language learning are similar to strategies for learning content" (p. 240). They give examples of metacognitive strategies, i.e., "selective attention, self-monitoring and self-evaluation" that can be used with every type of learning task (p. 242). A particular example is provided by O' Malley, Chamot, Stewner-Manzanares, Russo and Kupper (1985) who assert that the strategy of note-taking is effective for listening skills in both L1 and L2. They therefore conclude that language learning strategies may not be different from those that facilitate non-language learning.

Studies of transfer between L1 and L2 also indicate the commonality of metacognitive strategies. Walter (2004) advocates that what French students transfer from L1 to L2 reading comprehension are the structure-building processes. She further explains that failure of transfer is caused by insufficient L2 proficiency rather than structure-building ability.

Jiang and Kuehn (2001) examined the transfer of academic proficiency from L1 to L2 for low-intermediate ESL students in California. Their results reveal, not only interferences of L1 in learning L2, but also the positive transfer of perceived relevance of L1 strategies such as using prior knowledge, using context clues, making inferences. In Jiang and Kuehn's study, dramatically more students reported using context clues and making inferences to solve word problems in L2 than in L1, particularly in the group with higher L1 academic proficiency. This suggests that these students have learned strategies from elsewhere and that the strategies are universal to both language and non language tasks.

Although metacognitive strategies have been found to be unique to a specific domain, evidence is rather weak. For instance, Davidson and Sternberg (1998, p. 53) recognise the different quality of mental representations and problem-solving performances across disciplines and accept that "metacognition may to some extent be domain-specific". O' Malley et al (1985) interviewed ESL high school students and their teachers and found that the strategy use varies according to the learning task. However, these discrepancies were presented in frequency of use rather than types of strategies. Therefore, they concluded that there was no empirical support that strategies (whether cognitive, metacognitive or social-affective) were unique to second language learning as similar strategies were applied to different tasks in the L1 such as reading comprehension, problem-solving, composition and academic oral production. Even translation, which would appear to be specific to L2 tasks, was extensively used in accomplishing math problems. O'Malley et al (1985) therefore posit that:

> …there may not in fact be any learning strategies that are solely related to languages, but rather a subset of general learning strategies of particular use in developing second language skills (p. 577).

Therefore, although some cognitive strategies and knowledge are found to be domain-specific, metacognitive strategies, i.e., the higher level of thought processes that direct this strategic knowledge and knowledge about the person and the world, seem to be general to tasks in both L1 and L2. However, much more investigation is needed to determine which metacognitive strategies are used consistently across domains.

2.4.2 FL/SL Listening Skill vs Reading Skill

Ample evidence indicates that metacognitive knowledge and control or regulation is common to learning to listen and read in the FL/SL. The importance of phonological awareness and the ability to use that knowledge for efficient FL/SL listening (Voss, 1979, Hieke, 1987, Dejean de la Batie,1993 cited in Rubin, 1994; Sparks & Ganschow, 1993) and reading (Sparks & Ganschow, 1993; Walter, 2004) is widely recognised. Empirical evidence supports the view that less successful readers, like poor listeners, lack the knowledge and ability to break connected words into meaningful sections (Hieke cited in Rubin, 1994; Sparks & Ganschow, 1993). In addition, silent repetition or mental structuring, which seems to be specifically useful for L2 listening tasks (Chamot, 1993), has also proved to be helpful for reading comprehension (Walter, 2004).

Further support is provided by Chamot and Kupper (1989). In their longitudinal study of ESL students' use of strategies, they argue that types of language tasks differentiate types of strategy use. However, some strategies are found to be common to several tasks. For instance, self-monitoring and elaboration are prevalent for vocabulary learning, listening comprehension, cloze exercises and writing. These two strategies are also reported to be used with reading in other studies (Chamot & Kupper, 1989).

Chamot and O' Malley (1994), in their CALLA model which was based on an extensive review of the research, contend that strategies of the planning process include goal-setting and directing attention selectively when listening or reading. They also suggest a variety of monitoring strategies, e.g., recalling and comparing prior knowledge with new information, directing attention selectively and ignoring distractions to keep track of reading or listening. In problem-solving, inferencing or collaboration is deemed universal to listening and reading comprehension. Finally, after engaging in a particular task, they emphasise the importance of summarising writing (either orally or mentally) and self-evaluation.

Young (1997) investigated patterns underlying strategy use by 18 Chinese undergraduate students in Hong Kong when listening to audio-texts. Through think-aloud protocols, she found that the less successful students used a narrow range of strategies in second language listening comprehension. By contrast, the more successful students who were better in listening comprehension strategies constantly used six strategies including self-evaluation, summarising, elaboration, inferencing and giving feedback, e.g., showing that they did not get the message across. She concluded that there were patterns of strategy use, for example, many listeners used inferencing/elaboration and summarising whereas some employed metacognitive processes such as self-monitoring/self-evaluation and feedback pattern. These patterns occurred repeatedly during listening tasks. Further to this research is the finding that highly effective students of Spanish trained in learning strategies also used inferencing, elaboration, self-monitoring and selective attention with EFL listening comprehension (Chamot & Kupper, 1989).

Metacognitive strategies have also been identified with ESL/EFL reading comprehension (Chamot & O'Malley, 1987; Katib, 1997). Chamot and O'Malley (1987, p. 243) present strategies used while performing a reading comprehension task, i.e., recalling prior knowledge, self-monitoring, verifying what is known, assessing new learned knowledge and integrating new knowledge with known knowledge. Among others, Katip (1997) examined the use of other cognitive and social-affective strategies in reading comprehension monitoring strategies by second and fourth year students in a Thai university through the think-aloud protocols. Her subjects used strategies such as checking understanding of the text, asking for clarification, using existing world knowledge, rereading and comprehension monitoring.

Nonetheless, there is relatively little evidence of the uniqueness of strategies for listening or reading in FL/SL. Vogely (1995) examined university students' awareness of strategy relevance and actual strategy use in FL listening comprehension. Top-down strategies, that is, knowledge of the world, situations and human interaction such as understanding the gist of a text and using background knowledge were perceived to be the most effective listening comprehension strategies, but a significant number of subjects did not report using them. The strategies considered least relevant were also top-down strategies: anticipating, guessing or inferring what would come next in the text. The strategy that most of Vogely's subjects reported using was top-down, understanding the "gist" of the text. The least used strategy, i.e., focusing on grammatical structures, was bottom-up (which involves knowledge of words, syntax, grammar). Vogely's subjects generally reported using bottom-up strategies, i.e., recognising words, focusing on detail, mentally sounding out words or phrases. When faced with difficulty, they engaged with the text more actively, using further bottom-up strategies, i.e., continuing listening actively for clarification, using the next segment to understand the previous one and guessing the meaning of words or phrases.

In response to a previous study on reading (Carrell, 1989), Vogely (1995) points out differences in FL listening and reading strategies. While effective Spanish FL reading comprehension strategies were bottom-up, effective Spanish FL listening comprehension strategies were top-down. When dealing with incomprehension, Spanish FL readers used top-down strategies, but Spanish FL listeners used bottom-up strategies. Vogely concludes that different strategies might be required for accomplishing reading or listening. This is supported to some extent by Hallback (2000) who claims that metacognitive strategies serve learning in general, rather than meeting the requirement of a specific task. This remark is drawn from an analysis of the diaries of 12 undergraduate students for their knowledge about the person, the task and the use of EFL learning strategies involving planning, monitoring and evaluating, and problem solving.

Again relatively few empirical studies have looked into the uniqueness or commonality of metacognitive strategies in FL listening and reading. Therfore, this study draws this component into its investigation.

2.4.3 Approaches in Accessing Metacognitive Processes

As discussed in previous sections, the operations of metacognitive thought processing such as metacognitive control and regulation do not always yield observable behaviours. Some internal processes are not measurable or discernible. Thus, different methods have been used to try to access these internal processes. Both introspective and retrospective approaches have been widely used in accessing individuals' metacognitive knowledge and their ability to control and regulate this knowledge. These two approaches are also known as direct and indirect methods. McDonough (1995, pp. 9-10) describes a retrospective or indirect approach, where subjects are asked to think about or to refer back to the ways they acted and felt. They either provided these thoughts in writing or verbally or indicated their agreement and disagreement with examples of specific behaviour, strategies or techniques. A questionnaire, and discourse analysis and inventory checks were employed. Direct methods or introspection, on the other hand, are processes that allow the researcher to learn what is going on in informants' minds through their written/verbal reports or comments. The participant is asked to carry out a semi-structured or unstructured task and is observed while performing the task. The methods of data collection for the retrospective and introspective approaches are divided into protocol analysis, self-revelation, diaries, verbal reports and interviews.

An interview is an interaction between two or more parties, at least one of whom has a predetermined purpose (Stewart & Cash, 2000). Generally, it involves asking and answering questions. The interview is one of the most widely accepted research methods as it allows researchers to receive a substantial amount of information from respondents' spontaneous speech data (Chamot & Kupper, 1989; O'Malley, Chamot, Stewner-Manzanares, Kupper, & Russo, 1985; O'Malley, Chamot, Stewner-Manzanares, Russo et al., 1985; Wenden, 1986). Guided questions during an interview help lessen the risk of omitting a question. In interviews, the misinterpretation of questions is marginal because any ambiguity can be clarified immediately. Additional related information, such as reasons for a certain thought or performance, are more likely to be provided through the relaxed atmosphere of an interview. One disadvantage of the retrospective interview involves inaccuracy or incompleteness of memory causing some behaviours to be overlooked, particularly those that have become automatic and are activated at the subconscious level (Chamot & Kupper, 1989, p. 19).

Self reports and learning diaries are written forms of retrospection that can provide valuable data about language learners' thought processes and performances such as strategy use and language learning skills (Hallbach, 2000). Such information is not normally accessible or observable. In this case, informants are requested to note down whatever comes to their minds to respond to predetermined content with or without a specific format. Hallbach (2000) used learning diaries and a check list in her investigation of undergraduates' strategy knowledge and use in a term-long English foreign language course. Subjects were asked to keep a diary in which they recorded all the language-learning activities that helped them improve their English and that interested them. They were asked to record problems and what they intended to do about them. Language use was not specified. The checklist was developed from Moulden's rating scale (cited in Hallbach, 2000) and covered knowledge about person and task and strategies of planning, monitoring and assessment and problem solving when analyzing 12 of a total of 73 learner diaries. These diaries were chosen because they provided all components of informants' thought processes and behaviours.

Like other instruments that provide qualitative data, Hallbach (2000) identifies drawbacks in that self reports suffer from measurement problems. It is possible that participants record what they should do rather than what they actually do. Also many such thought processes operate automatically and may be unnoticed and not recorded. Hallbach also reports difficulties in assessing short entries, in rating strategies, and in analyzing a small number of entries. However, this instrument does show discrepancy between successful and less successful learners. Research using this instrument (e.g., Hallbach, 2000) shows that more successful learners use strategies more frequently and more effectively than less successful learners. Successful readers use resourcing strategies, that is, they choose and plan an appropriate problem-solving activity. These strategies are problematic for less successful learners. In addition, self-monitoring and self-assessment were absent in weaker learners' reports so they had a limited strategy repertoire to assist their FL learning.

Think-aloud protocols have been used extensively in accessing EFL/ESL learning strategies (for example, Chamot & Kupper, 1989; Katib, 1997; Young, 1997). Young (1997) used think-aloud protocols to investigate the patterns underlying strategy use in SL listening comprehension. The participants, 18 Chinese undergraduates in Hong Kong, were requested to verbalise their thoughts while listening to three commercial listening texts. Before performing the tasks, participants were trained and were able to practise reporting whatever came into their minds when they heard the texts. They were asked to give a signal when they thought of anything and the tape would be stopped to let them describe their thoughts. Through the quantitative analysis, using an implicational scale technique, Young found that the instrument elicited various types of strategies and "around eighty percent of the time their strategy choices were explicable" (p. 39). However, a disadvantage of the quantitative analysis was that it could not provide the sequence of strategy use. Young overcame this limitation by conducting a qualitative analysis, which gave comprehensive results of patterns of metacognitive strategy use. Other researchers have also expressed concerns about think aloud protocols. Katib (1997), for example, stresses the limitations of think-aloud protocols concerning the number of participants and the time it takes. Chamot and Kupper (1989) state that, while the think-aloud protocols allow students to verbalise their thought activating immediately, the disadvantage is that they may not report all thought processes.

Language learning research that provides quantitative data such as perception and learning strategy questionnaires has been used extensively for capturing retrospective behaviours in EFL/ESL studies. Generally, participants are requested to rate the level of agreement to descriptive items, ranging from strongly disagree to strongly agree or on a frequency of use basis, or both (Intaraprasert, 2004; O'Malley, Chamot, Stewner-Manzanares, Russo et al., 1985; Politzer, 1983). These questionnaires contain strategies or behaviours that the researcher lists or selects from the literature, for example, the Learning Strategies Review Questionnaire (Chamot, 1993), the Strategy Inventory for Language Learning (Oxford, 1990) and those constructed by O' Malley and others (1985) and Politzer (1983). In order to ensure that the responses are actually participants' perceptions, Carrell (1989 cited in Vogely, 1995) constructed a Metacognitive Awareness Strategy Questionnaire (MASQ) where judgements of strategy relevance were provided by respondents. However, this instrument has not been as widely used as those based on predetermined judgements.

Intaraprasert (2004) used questionnaires to examine unsuccessful learners' use of classroom-related strategies and their perceptions of the usefulness of language learning strategies generally. Subjects included 193 first year undergraduate students taking English as an introductory course at a university in Thailand. Although results indicated that the unsuccessful language learners perceived most of the proposed classroom-related strategies (28 out of the 29 strategies) as very helpful in enhancing their language learning either in or out of the class, only 12 out of the 29 strategies were reported as actually being used. The use of strategies was highly related to perceptions of relevance for only one strategy, 'regularly attending class.' Intaraprasert concluded that these results might have been caused by the classroom attendance that was policy and classroom activities that were interesting, although the information gained from the questionnaires did not provide a definitive reason.

As seen above, data collected from each approach has its own merits and limitations. According to McDonough (1995, p. 10), numerical data from questionnaires can be analyzed by correlation and cross-tabulation, but it merely elicits people's attitudes and beliefs about what they want to do, will do, or have done. According to McDonough, it is also possible that informants do not tell us what they actually do. While we can learn about what is going through the mind of a participant while she/he is doing a task from a think aloud protocol or introspection, we cannot find out what a participant does not pay attention to. Retrospective reports such as writing in a diary can give us valuable information about mental processces, but they still suffer in terms of credibility (p. 10-11). Responses in an interview might provide this in-depth information, but it is always possible that interviewees tell us what they think they are expected to say. Moreover, an interview that takes longer than 45 minutes might distort the data as participants become bored (Kraikosol, 2004, p. 2). Transcribing data from an interview is also time consuming and categorising the data from an interview is challenging as the data might vary uncontrollably and unexpectedly. The researcher might also be tempted to make incorrect inferences on the basis of the interview data.

In order to overcome the limitations of each of these tools, a combination of both qualitative and quantitative methods is suggested (Hallbach, 2000; McDonough, 1995; O'Malley & Chamot, 1990). Many studies of learning strategies have successfully used multiple approaches. For instance, Chamot and others (1992) used think-aloud protocols as well as retrospective interviews in which subjects were asked to explain how they solved the problem. Yang (1998) gathered data through peer-interviews, questionnaires and learning diaries. White (1995) used questionnaires and verbal protocols in her research. In another study by White (1999), interviews, ranking exercises, questionnaires and scenarios were all used to examine learners' perceptions. Observation and self-report questionnaires were used by Hamman, Berthelot, Saia, & Crowley (2000). Questionnaires and classroom observation were used by Chamot (1993) and self-regulatory style questionnaires and self-report action and emotion measurements were used in Miserandino' s (1996) research.

In view of the range of and differing success of various instruments, this study uses multiple approaches in investigating perceptions of strategy relevance, strategy use and the incorporation of strategies in teaching.

SUMMARY

The development of autonomous learners is included in the requirements of national education in Thailand. This review of the literature has shown that learning autonomy and FL/SL learning requires metacognitive knowledge, control and regulation because they play a prominent role in improving learners' sense of responsibility and their ability to take charge of their own learning. This sets quite a challenge for EFL lecturers in Thailand, particularly at the tertiary level, as English in the Thai education system is a foreign language and exposure to it is limited to academic settings. Also only a few English units are provided for four year programme students who enroll in disciplines other than English. Insufficient practice of the most-needed skills for independent learning language is evident. For example, current teaching and learning focuses on language features such as vocabulary, grammatical rules and translation. Some evidence shows that attempts to meet learners' needs and to help learners achieve the national objectives have been made, however, a lot more attention to this is needed.

The literature on metacognition theory is inconclusive regarding the interaction between metacognitive knowledge and how the control and regulation of this knowledge that influences actual behaviours. Metacognitive knowledge includes declarative knowledge, procedural and conditional knowledge. Declarative knowledge involves what one knows about one's cognitive states and activities and one's affective states. Procedural knowledge refers to what one knows about how one thinks. Conditional knowledge involves when and why to apply this knowledge and its associated strategies or strategic knowledge. Individuals control and regulate these kinds of knowledge through monitoring, evaluation, planning and problem solving activities. Knowledge and experience that are repeatedly used and proven effective will be stored and available for further use. Otherwise, they will be discarded.

The literature also cautions scholars in the field regarding inappropriate metacognitive knowledge and incomplete or inefficient metacognitive control and regulation. Inappropriate knowledge or ineffective control can lead to poor decision-making and the accumulation of false beliefs, and therefore incorrect knowledge for further use. This will create obstacles for learning or knowledge development.

The transfer of metacognitive knowledge across learning domains suggests that metacognitive knowledge and processes are general, although a few experts have opposed this idea. In the case of both language and non-language tasks, ample evidence indicates that they are transferable within a learning area, e.g., between listening and reading in FL/SL, as well as across different areas such as between mathematic problem-solving and language learning. Only a few studies show that some strategies are specific to one or the other skill or discipline.

Many researchers maintain that it is not easy to access or observe such internal variables using a single instrument. Most have used different approaches such as interviews and questionnaires, self-reports and interviews and/or think-aloud protocols and measurement tests. Therefore, multiple approaches have been used in this research to ensure the validity of findings.

Investigating what metacognitive knowledge and experience learners possess and whether this knowledge/experience are appropriate for learning FL/SL tasks is therefore challenging. However, this knowledge is important as it can help to decrease the time spent developing autonomous learning in FL/SL language and in other domains of study.

3. METHODOLOGY

OVERVIEW OF THE CHAPTER

This study explores the students' and instructors' perceptions of relevance and actual use of or incorporation of strategies in the Sicences and Arts; the specific metacognitive strategies that learners transfer from learning subject matter to learning English; and the metacognitive strategies appropriate for promoting independent learning of English as a foreign language. To pursue each of these themes, the chapter includes the design of the research, the methodology and the data gathering and data analysis procedures.

3.1 DESIGN

As stated in Chapter 1, the aim of this study was to provide a list of metacognitive strategies for learning English independently. This led to the major research questions which relate to: students' and instructors' awareness of strategies for learning versus learners' actual use of the strategies; students' transfer of metacognitive strategies from learning their subject discipline to learning English and gaps in students' and instructors' perceptions and applications of the strategies. The ultimate purpose was to provide the impetus for training independent English language learners.

The research has sought to describe the potential difference between participants from the given disciplines, particularly between their awareness and their actual application of learning strategies in the discipline subject(s) and in English listening and reading. In so doing, merely to rely on a quantitative approach is not sufficient to reveal all of the desired variables. This is connected to the belief that both quantitative and qualitative research approaches have their limitations, the former with respect to the lack of in-depth data and the latter with respect to the adequacy of assessment criteria. As a result, this exploratory study adopted a combination of qualitative and quantitative methods based on triangulation and grounded theory.

To satisfy triangulation criteria, the application of multiple approaches to measuring the same variables was adopted. This was done with the intention that the quality of the research findings would be enhanced in terms of reliability and validity as well as depth of insight into the object of study (Miles & Huberman, 1994; Nachmias & Nachmias, 2000; Patton, 1990). To accord with grounded theory, a comparison between the data in this study and those analysed from other studies was conducted (Strauss & Corbin, 1990). The literature involving the target variables, i.e., effective strategies in reading and listening in foreign/secong language, was therefore reviewed again after the data collection and analysis had begun.

To achieve a list of metacognitive strategies that assist FL/SL learners from different disciplines to be able to learn English independently the study involved two phases. Phase 1 involved a pilot study in order to assure the validity and reliability of the instruments. Phase 2 investigated informants' existing knowledge and the actual strategies that students employ to approach learning two receptive skills (listening and reading) in the subject domain and in English or those lecturers include in teaching the discipline subjects. This phase also included a further review of the literature and the determination of the metacognitive strategies required for discipline-specific learning. Table 3.1 (below) summarizes the research design, data collection approaches and data analysis.

To access knowledge about learning strategies and regulation of the cognitive and affective strategies, this study adopted the most commonly used methods of data collection—self reports and interview schedules. As pointed out previously (section 2.4.3), each method has certain advantages as well as limitations. For example, while these retrospective methods enable the researcher to access the information, they do not guarantee that the reported variables are those that subjects actually executed. It is also possible that variables reported are data that the researcher looked for, not the data itself, which this implies responses are affected by other variables. Memory and other factors such as beliefs and expectations can affect an individual's report on previous experiences (Anderson, 1993; Brown, 1984; Dominowski, 1998).

The choice of using survey questionnaires was made for two reasons. The first was to minimize the specificity of the retrospective measurements, the second was that the survey questionnaires enabled the researcher to focus on the particular areas of interest and to supplement the qualitative findings (Nachmias & Nachmias, 2000). Yet, these methods still cannot fill the gap between the respondents' perceptions and their actual behaviour. Therefore a further introspective qualitative approach such as the think-aloud protocols were selected to serve this purpose.

In addition, to ensure the reliability of the specific-discipline learning strategy list to improve the independent learning of EFL, an extensive research of the literature was carried out. Effective strategies for learning FL/SL in foreign language settings were reviewed and provided the criteria for the determination of suitable learning strategies for the specific disciplines.

Table 3.1 Research Design, Data Collection Methods and Data Analysis.

	Objectives	Data Analysis			
		Interviews	**Survey Questionnaires**	**Self reports**	**Think-aloud protocols**
Phase 1	To assure the validity & reliability of the instruments	1. Using native language 2. Experts' consideration – face & content validity; the difficulty & suitability of the tasks & language use			
		Informants' Comments— brevity& clarity	*Cronbach's alpha* coefficient	Informants' Comments— brevity& clarity	Per cent commonality of observations
Phase 2	To examine perceived relevance & use of metacognitive strategies in learning the major sub ject content (MSC)	A grounded categorisation	*Spearman's Rank Order Correlations (rho)*, per cent agreement/ frequent use, *Mann- Whitney U*, *Friedman* & *Wilcoxon match -paired signed ranks* tests	A grounded categorisation	A checklist
	To examine perceived relevance & use of metacognitive strategies in learning English	-	*Spearman's Rank Order Correlations (rho)*, per cent agreement/ frequent use, *Mann-Whitney U*, *Friedman* & *Wilcoxon match -paired signed ranks* tests	A grounded categorisation	Compare checklists
	To find relationship between perceived relevance and use	Compare case(s)	*Spearman's Rank Order Correlations (rho)*, per cent agree ment/ frequent use, *Gamma*	Per cent agreement/ frequent use	Compare checklists
	To explore a transfer of metacognitive strategies from the MSC to English	-	*Spearman's Rank Order Correlations (rho)*, *Kendall's tau-b,* per cent agreement/ frequent use	Per cent agreement/ frequent use	Compare checklists
	To decide a list of strategies for different disciplines	Compare results from this study with those from previous studies			

3.1.1 Participants

Like many other tertiary institutions (Marshall & Rowland, 1993), teaching and learning in the Rajabhat Institute Ubon Ratchathani is carried out in 5 faculties: Sciences;

Technology and Sciences; Humanities and Social Sciences; Business Sciences; Education and Agricultural Sciences. Three of these five faculties, Sciences, Technology and Sciences, and Agricultural Sciences, provide programmes that lead to a Bachelor of Sciences (B.Sc.) degree. Two of them, Humanities and Social Sciences and Business Sciences, provide programmes that lead to a Bachelor of Arts (B.A.) degree. The Faculty of Education is the only faculty that provides the programmes leading to the degree of Bachelor of Education (B.Ed.).

As suggested in the literature (Marshall & Rowland, 1993), the programmes and faculties at the Rajabhat Institute Ubonratchathani provide a body or closely-related bodies of knowledge called disciplines. For instance, the Agricultural Sciences and Communication Arts, which are participants in this research, teach their *domain-specific knowledge* which included theoretical knowledge and technical skills relevant to their subject. These disciplines or bodies of knowledge are different based on a culture in itself with its own discourses, its own language and vocabulary. The theoretical knowledge required of Agricultural Science students spans generic areas such as 'biology, chemistry, generics and mathematics, specific Agricultural content such as planting and cultivating, and other fields such as animal husbandary, accounting and marketing skills'. The technical skills relevant to Agricultural Sciences include, for example, farm/field work, plant nursery skills and laboratory skills. The knowledge specified in the Communication Arts content area involves different kinds of media and current events, transmitting or broadcasting information and audience types. The technical skills identified as relevant to the subject included communication skills, instrument operation, language skills, and interpersonal skills.

Unlike Marchall and Rowland (1993) who assumed difference between disciplines, the teaching and learning activities in both Agriculatural Sciences and Communication Arts revolve around lectures and practical sessions. Supervised practice in the two fields is also similar, as are the assigned tasks/projects, work apprenticeships and student initiated tasks. In addition, the learning tasks demand students demonstrate the application of theory, connection across separate inputs, and repeated practice of technical skills. This supports Anderson (1993) in that both dischiplines have in common that they strive for understanding through critical questioning. Recent studies have revealed findings about the commonality of these broad areas of study. The universality of methods to acquire and use knowledge in different areas of expertise in arts, sports and writing as well as in formal learning settings (Zimmerman, 1998) raises the question as to whether or not there may be overlapping boundaries across disciplines and major areas of scholarship.

Therefore, participants from both the Sciences and Arts were sought for this study. Second year undergraduate students enrolled in a four-year course of study leading to a bachelor degree in both the Arts and Sciences were chosen as participants (P). Students enrolled in any programmes that lead to a Bachelor of Education were excluded because their syllabus contained explicit instruction about learning strategies.

The technique of selection of samples in this study was cluster random sampling. There are 14 programmes in Arts and 18 in Sciences at the Institute. One programme from each discipline was selected. The instructors who taught these groups of students in one of their major subject content areas were then invited to be involved.

Eventually it was decided to gather data from 74 students and 10 instructors from the Agricultural Science programme and the Communication Arts programme at the Rajabhat Institute Ubon Ratchathani (RIUbon), Thailand because these two groups were seen to provide a very contrastive population. Forty-five participants were in Communication Arts and thirty-four were in Agricultural Sciences. Five instructors from each discipline volunteered to participate. Five of the Communication Arts students withdrew from the study before finishing the process.

The ages of the Communication Arts students ranged from 19 to 25 years. Two informants were male; the other thirty-eight were female. The informants perceived themselves as having fair (43 per cent) to high (57 per cent) proficiency in learning in the discipline, but poor (85 per cent) to fair (15 per cent) proficiency in learning English.

The Agricultural Science students' age span was from 19 to 26 years. Twenty-four were male and ten were female. They perceived themselves as having fair (51 per cent) to high (49 per cent) proficiency in their major area of study, but poor (91 per cent) to fair (9 per cent) proficiency in learning English.

Communication Arts domain knowledge involves the knowledge essential to a career in TV/radio broadcast, both in front of and behind the camera or microphone. Students in Agricultural Sciences study a wide variety of Sciences such as Biology, Chemistry, Soil Sciences and apply them to Agricultural work, for instance, Farming, Planting, Animal Husbandary. Both groups of students take two units of English as part of their programme. One is English for Communication and Information Retrieval, the other is English for Specific Purposes. These units are compulsory. They meet in class for one hour and forty minutes each week.

One of the five instructors who was teaching the course in Communication Arts was male, the other four were female. Their ages ranged from 27 to 35 years with an average age of 33. One held a Bachelors Degree and four held Masters Degrees. Their length of teaching experience ranged from a minimum 4 years to a maximum of 9 years.

Among the instructors teaching Agricultural Sciences, three were males and two were females. Their ages ranged from 37 to 56 years with an average age of 45 years. Three held Masters Degrees and two had Doctorates. Their teaching experience ranged from a minimum 8 years to a maximum of 15 years. The Agricultural Science Instructors were not only older, but also had more teaching experience than the Communication Arts instructors had. This could have influenced their perceptions and teaching practice.

The interview guides and think-aloud protocols were administered on a volunteer basis. Every participant responded to the survey questionnaires and provided self-reports. All 5 Agricultural Science instructors and Communication Arts instructors were invited to be interviewed. Some 8 Agricultural Science students and 11 Communication Arts students were requested to participate in the interview and think-aloud protocols.

3.1.2 Instruments

The instruments for this research included interview guides, survey questionnaires, think-aloud protocols and self-report. Separate interview guides and survey questionnaires were constructed for students and instructors. The study focused on the learning strategies used in receptive skills, i.e., listening and reading, as these are the skills most often employed in the Thai context (Aksaranugraha, 1995; Suwaparp, 1998). The following sections describe these instruments and how they were used.

Self reports

Separate instructions were distributed to students (see Appendix 3.11) and instructors (see Appendix 3.12) for the self-reports. In order to elicit the nature of learning in general, as well as the strategies used both in listening to lectures/listening comprehension[2] and in reading, students were asked to write about how they approached these activities in learning any discipline subject and English units. The instructors were asked to provide information only on the subject(s) they had been in charge of.

Think-aloud protocols

When invited, 19 student informants (11 students in Communication Arts and 8 students in Agriculatural Sciences) volunteered to take part in think-aloud tasks. Two sets of tasks, listening to lectures and reading in Thai and in English, were prescribed for both groups

[2] The listening tasks in the L1 and in English are different in this study. While listening tasks in L1 or in learning major subject content mainly involve listening to lectures which call for learners to cope with the content, most listening tasks in English aim at listening comprehension in which ability to understand English language is a primary goal. Therefore, the former is called ‘learning from lectures’, the latter ‘listening comprehension’.

of students. Instruction was provided on how to do a think-aloud report and what was required to complete the activities.

The lecture scripts and reading passages used for the think-aloud tasks were authentic in that they were chosen to relate to the programme curriculum and to students' interest. Questions of local controversy were chosen in order to provide the most interesting topics for students of this age, after Intarasoot (1981, as cited in Suebthin, 1992). Scripts and passages were also chosen in order to elicit the informants' metacognitive knowledge. The materials in Thai for both disciplines were about twenty thousand words long. Many studies, both in Thailand and other countries, have revealed that reading in the first language is generally quite fluent as readers have quite high competence (Barnett, 1988; Suebthin, 1992). This can be accompanied, however, by a lack of awareness of ways to deal with reading problems. Therefore, a very long passage was assigned to be read in a limited time in order to challenge students to employ *Planning* and *Problem-solving strategies*. The topics adopted for both fields are displayed in the Table 3.2.

Table 3.2 Think-aloud tasks for Communication Arts and Agricultural Science students.

	Listening	Reading
Communication Arts	**Thai Task A1**: Broadcasting Talk programmes & News	**Thai Task A2**: Official Information Act B.E. 2540
	English Task A3: Truth Pays Dividends with the Public	**English Task A4**: Tips for Writing Effective News Releases
Agricultural Sciences	**Thai Task S1**: Probability And Goodness of Fit—Two Independent, Non-genetic Events	**Thai Task S2**: Cloning
	English Task S3: Biochemistry	**English Task S4**: Nuclear Transfer

The content of tasks for Communication Arts students (Tasks A1-A4) related to Public Relations. (See details in Appendix 3.8.) In Task A1, after listening to a Thai lecture on broadcasting compiled by Duangsri (2001), the informants were asked to write a script for a 1-minute broadcast. An instructor who had taught this subject for five years agreed to have her lecture taped. In the Reading Related Material Task (Task A2), students were to do a two-page summary after reading the Official Information Act B.E. 2540 (Office of the Official Information Commission, 2001).

In the English Listening Task (Task A3), after listening to a broadcast entitled "Truth Pays Dividends with the Public" by Jean Valin APR, the informants were asked to answer six multiple-choice questions. For the English reading task (Task A4), students summarized what they had read about tips for writing effective news releases by Tom Haibeck APR.

For Agricultural Science students, the content of each task related to Biology and Biochemistry. After listening to a Thai Lecture (Task S1) on "Probability and Goodness of Fit: Two Independent, Non-genetic Events" (compiled by Aoki, 2001), the informants were asked to do an exercise relating to the lecture. The lecturer who was tape-recorded had been teaching this subject for over ten years. In Task S2, after reading in Thai about Cloning, the students were asked to write a two-page report. After listening to a lecture (Task S3) on Biochemistry delivered in English, the informants were asked to answer six questions. In Task S4, English reading, the informants were asked to read an article on Nuclear Transfer and to prepare a two-page summary.

A native speaker who was a contract teacher working at the institution during the academic year 2001 and was teaching English and non-English major students recorded the English listening tasks for both disciplines (see Appendix 3.9). The lectures were video and tape-recorded. Participants were requested to think aloud while watching the L1 lectures on video or listening to an English cassette tape.

While the volunteer students were performing think-aloud tasks the video was recorded for repeated observation. In the mean time, the researcher observed their use of learning strategies focused on planning, monitoring, problem solving, and evaluating. A checklist was developed from the literature and used for the survey questionnaires by the researcher to capture the concurrent metacognitive strategies reporting. (This is detailed in Appendix 3.10.)

Interview Guides

The interview questionnaires for both instructors and students consisted of seven open-ended questions and seven guided questions. The open-ended questions inquired into the general nature of teaching and learning in the given disciplines. The guided questions were aimed at investigating the learning strategies that the students used or were observed to use by their lecturers in their major subject content. The interview questions were adapted from Baird (1995), Huitt (1997), and Wenden (1991). In order to encourage informants to clarify their responses in the interviews, further expressions and/or questions were added where appropriate. The interview guide for instructors is presented in Appendix 3.3. Appendix 3.4 contains the interview guide for students.

Survey Questionnaires

Both survey questionnaires sought information on the specific metacognitive strategies used in listening to lectures/listening comprehension or reading materials under four categories: *Planning*, *Monitoring*, *Problem-Solving* and *Evaluating Strategies*. Each category contained 10 items. In addition, spaces were provided for any other strategies that informants might have liked to add. The strategies were adapted from Chamot, Barnhardt, El-Dinary and Robbins (1999); Mitchell (1995); Huitt (1997); Halter (2000) and Kujawa and Huske (1995). The pre-selected strategies and their actual use in learning content and language are available in Appendix 3.5.

The instructors were asked to quantify how relevant they believed each strategy was to learning the major subject content and the extent to which they incorporated these strategies in their teaching. Level of importance was measured using a five-point *Likert* rating scale, ranging from 1 – 'Strongly disagree' to 5 – 'Strongly agree'. A five-point scale was also used to assess the application of the strategies in teaching. This ranged from 1 – 'Never do it at all' to 5 – 'Always do it explicitly'. Details are shown in Appendix 3.6.

The students were asked to indicate their level of agreement on the importance of the four categories of strategies and the use of them in learning their major subject content and English. For each subject, the questionnaires provided two receptive skills: listening to lectures or reading related materials. To identify informants' awareness of the four categories of the strategies in relation to these two receptive skills, a five-point *Likert* rating scale ranging from 1 – 'Strongly disagree' to 5 – 'Strongly agree' was employed. The same numerical scales, ranging from 1 – 'Never make use of it' to 5 – 'Always make use of it', was adopted to measure the informants actual use of the strategy groups (see Appendix 3.7).

Details of participants for each data collection approach are summarized in Table 3.3.

Table 3.3 Participants of each measurement.

Measurements	Participants		
	Students	Instructors	Total
The Self reports	41 Comm.Arts 33 Ag. Sci.	5 Comm.Arts 5 Ag. Sci.	46 Comm.Arts 38 Ag. Sci.
The Think-aloud protocols	11 Comm.Arts 8 Ag. Sci.	-	-
The Interview Guides	11 Comm.Arts 8 Ag. Sci.	5 Comm.Arts 5 Ag. Sci.	16 Comm.Arts 13 Ag. Sci.
The Survey Questionnaires	41 Comm.Arts 33 Ag. Sci.	5 Comm.Arts 5 Ag. Sci.	46 Comm.Arts 38 Ag. Sci.

3.2 A PILOT STUDY: VALIDATION AND RELIABILITY OF THE INSTRUMENTS

To ensure the validation and reliability of the instruments in Phase 1, the following tasks were conducted.

First, the instruments, survey questionnaires, interview schedules, lecture scripts and readings for the major subject think-aloud activities were translated into Thai. For the major subject, an instructor from each discipline who was handling the unit relating to the chosen scripts was asked to give lectures in Thai in order to avoid any language barrier. The lectures were video taped, reviewed and revised in accordance with the instructors' level of satisfaction.

Second, experts from Science, Arts and English were asked to consider the face validity, content validity and the difficulty and suitability of the instruments and tasks. For the purposes of this study, experts were defined as qualified Rajabhat staff who had taught in the courses or had conducted English Translation units for at least ten years. (See the names of the experts in Appendix 3.2.) They examined the research objectives in relation to the questions and instructions, the difficulty and suitability of the tasks, as well as the language used. Based on their feedback, some Thai wording was adjusted to help clarify the meaning of the text.

Third, to test the validity and reliability of the instruments and the feasibility of research design and data collection procedures, a pilot project was launched in semester 2 of the 2000 academic year. Second year students in the Arts and Sciences were requested to complete each questionnaire and task and to give feedback on the brevity and clarity of the wording and instructions, and the appropriateness of the time requirement. These students were not included among the research subjects.

Thirty students, fifteen for each field of study, and twenty instructors, ten from each field of study, agreed to take part in the pilot project. They all responded to the questionnaires. Ten students, five from each discipline, volunteered to carry out the self-reporting, think-aloud tasks, and to be interviewed. An instructor from the Arts group, who taught in Thai courses relating to information media and two instructors from Sciences, one from Physics and one from Soil Sciences, volunteered to provide self-reports and to be interviewed.

The reliability of the survey questionnaires was assessed using *Cronbach's alpha* coefficient in SPSS 10 for Windows. The tolerated reliability was no lower than the range of 0.6 to 0.7 (Hair, Anderson, Tatham, & Black, 1998). The measure of the overall questionnaires for students and instructors was .98 and .975, respectively. Therefore, the instruments were deemed consistent and reliable.

During the initial observation a checklist was used to manually record the think-aloud tasks, which were also video tape-recorded. After one month's interval the researcher observed each informant once again, by watching that same video, and recording the observations through the same checklist. The number of strategies recorded in the first and second observations were almost the same, with a slight (10 per cent) increase in the second count. Hence, the percentage of commonality was 90; the differences were additional strategies recorded the second time, because the researcher had gained more experience by that stage. In addition, where there was opportunity, a tape recorder was used to record more learning strategies provided by the students.

3.3 REVISION OF INSTRUMENTS AND PROCEDURE

For each comment and problem occurring, the relevant instruments were reviewed and modifications made as follows.

3.3.1 Self reports

In response to the pilot study, the following question was added **"You may keep in mind a subject in either Agricultural Sciences or Communication Arts that is the most important to you if it helps**" to the self reports instructions.

3.3.2 Interview Guides

From the comments during the pilot interviews and in a conversation with the instructors after the interview about how the instructors evaluated their students' progress, the researcher added one more question, e.g., **"What processes do you use to evaluate your students?"**

3.3.3 Survey Questionnaires

Some Thai wording and punctuation were changed to make the meaning more clear.

3.3.4 Think-aloud Tasks and Observation Record Chart

Modifications to the think-aloud tasks and the checklist were made on the basis of the problems encountered and comments provided by the students in the pilot study. For instance, the observer failed to record some phenomena reported since the students sometimes expressed their thoughts at great length and took considerable time deciding which strategies they used. The amended tasks and checklist for both disciplines are shown in Appendices 3.8-3.10.

The procedure of each task was subsequently revised and the the time allocated to carry out each task was increased by five minutes to a total of 25 minutes. More clear directions were developed so that informants would be fully aware of the objectives of each task or exercise and how to carry out the task. Before starting each task, the informants checked their understanding and during the tasks the researcher gave reminders such as, “what are you thinking?” whenever informants were silent for about 15 seconds. Such reminded helped to direct informants’ attention toward their own thoughts and enhances the metacognitive explanations (Dominowski, 1998, p. 29).

The first observation was made while each informant was doing a task. The second observation was made from the video a month later. To avoid missing any data, observations were recorded every five minutes for a duration of 30 minutes. Thus, the thoughts described during minute 1-5, 11-15 and 21-25 would be recorded. Learning strategies that were explained in response to guided questions were not recorded in the checklist. These were not considered to be metacognitive strategies because they were encouraged by an outside agent. However, the strategies identified 10 to 15 seconds after the guided questions were considered the informant’s own decisions and metacognitive (Dominowski, 1998). Therefore, they were recorded. Based on the benefit of video record, if the checklists between the first and second record were different, the second record would be used in the analysis.

3.4 DATA COLLECTION

In phase 2, the collection and analysis of data included investigations of the informants’ existing metacognitive knowledge and strategy use/incorporation of strategies and the determination of the metacognitive strategies required for students in the two disciplines.

3.4.1 Investigation of Existing Learning Strategies

The learning strategies which informants perceived as relevant to learning and instructors incorporated in teaching major subject content and students used in learning their major subjects and which they had brought with them to the foreign language class were investigated through the following procedures.

The study was conducted in semester one of the 2001 academic year. As it was not part of any unit that students were enrolled in, participants were asked to respond to survey questionnaires and interview guides, to accomplish think-aloud protocols and to provide self reports after their regular classes on an appointment basis.

To ensure that the different data collection approaches would not affect each other, a sequence of approaches was determined. All subjects started with the self-reporting task in the third week of semester one. Finally, they did another self-reporting task in week eleven of the same semester. Those who volunteered to take part in the interviews and think-aloud protocols were interviewed and accomplished the think-aloud tasks. Then, all informants filled in the survey questionnaires. Finally, they wrote the second self-report. A cassette recorder and video recorder were used for the interviews and a video recorder for the think-aloud reports.

The informants were asked to provide the first self-report after signing a consent form. Responses from the interviews and self-reports were sent back to the interviewees a week later for a confirmation check of whether the answers were exactly as they had intended.

A week after the initial self-report, student informants were issued with the questionnaires by an instructor a few minutes before finishing their classes. The lecturers of both classes were asked to collect the completed questionnaires and return them to the researcher. For instructors, the researcher distributed the survey questionnaires and collected them.

The interview was a one-on-one in depth interview. It was conducted in a studio that was considered to be a familiar location for the students. This studio provided high quality electronic instruments and less distraction. The interviews took about 12-22 minutes depending on the informants' responses. The first five minutes was spent on making informants feel relaxed.

The think-aloud report was taped in another studio that was available for television or videotaping. Informants could work with friends and ask questions during the activities if they wanted to. The researcher did the observation from the control room. If informants asked questions, the researcher entered the studio to give them support.

3.4.2 Determining Metacognitive Strategies for Discipline-Specific Training Needs

The determination on which metacognitive strategies suit the needs of students in Agricultural Sciences and Communication Arts was conducted by comparing results from 3.4.1 with an analysis of previous research and literature on effective learning strategies in a second/foreign language setting. These were strategies that could empower students with the ability to learn independently. The analysis served as a basis for determining the list of learning strategies for a particular discipline.

Two steps of determining Metacognitive Strategies for Discipline-Specific Training needs were carried out. Firstly, the learning strategies gained from the four different approaches in this study were analysed. Secondly, a comparision between students' existing strategies gained from this study and the proven successful strategies in previous studies for listening and reading was made. A list of discipline-specific training needs in which metacognitive strategies was provided for the respective disciplines. These strategies were presented in three broad categories: metacognitive knowledge, metacognitive control and regulation for two skills of listening and reading.

The two skills, listening and reading, included practical learning strategies focused on the foreign language listening and reading ESP tasks. The **listening strategies** category involves learning strategies that facilitate the demonstration and application of knowledge in order to comprehend the spoken information. The **reading strategies** involve strategies aimed at acquiring and understanding written information.

Data gathering from phase 2 are summarised in Figure 3.1.

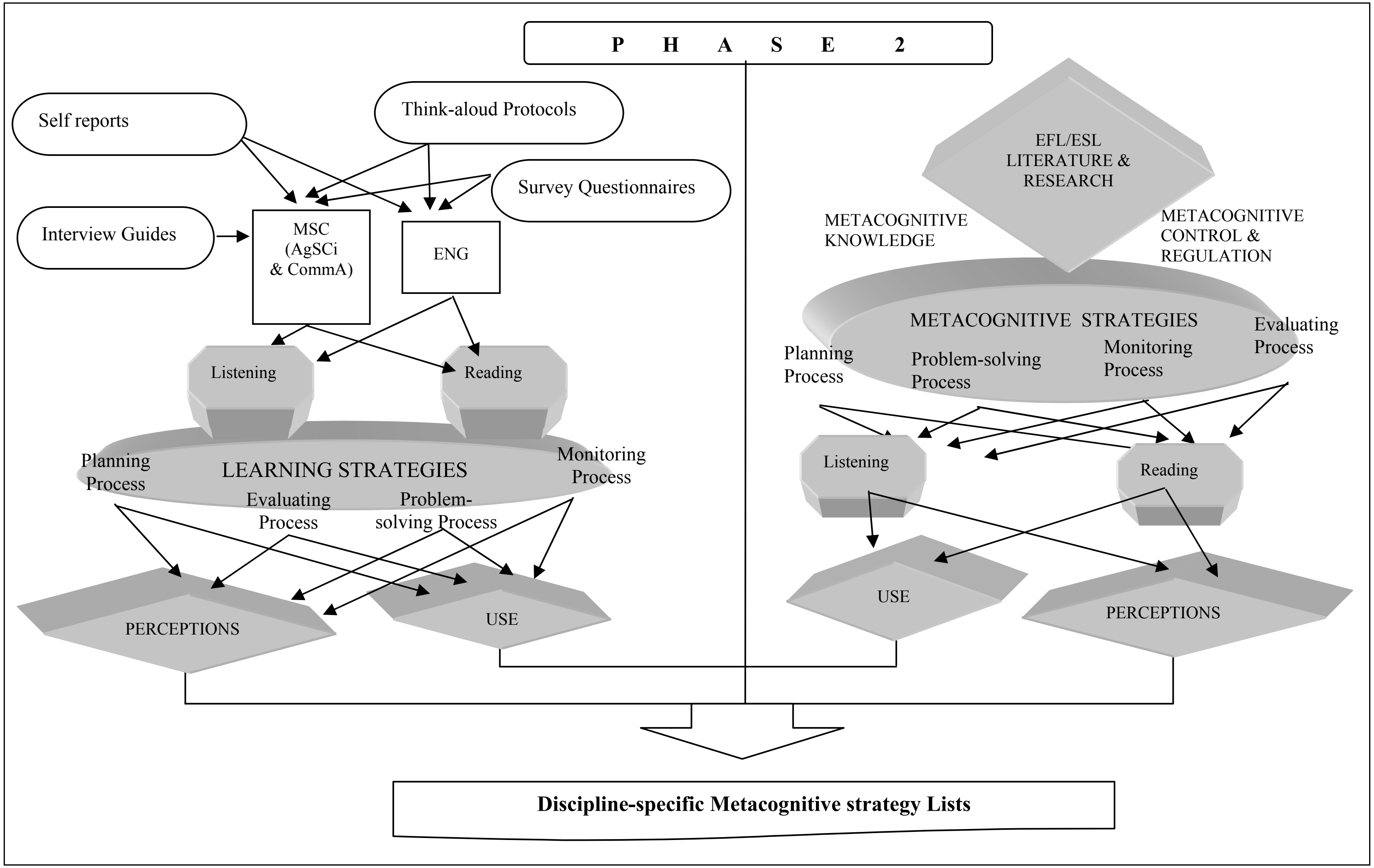

Figure 3.1 A summary of data collection and analyses in Phase 2.

3.5 DATA ANALYSIS

The analysis of data gained from the quantitative and qualitative approaches in Phase 2 was carried out separately (see Table 3.1).

3.5.1 The Analysis of Quantitative Data

Data collected from questionnaires and think-aloud protocols were processed into separate spreadsheets and analysed using SPSS version 11 for Windows. A summary of statistics used is shown in Table 3.1 above.

Questionnaires

This research explored the possibility that Agricultural Science and Communication Arts students may differ in terms of the perception and regulation of metacognitive strategies. In other words, potential differences were investigated. The rating scales discerning informants' perceptions of the relevance, utilization or incorporation of strategies in teaching are ordinal data. The students and instructors' responses were processed into separate spreadsheets and calculated. Overall percentage, median scores and ranges were calculated by aggregating the results for the ten relevant strategies. For each individual strategy, percentage responses and median scores were calculated for the Agricultural Science and Communication Arts informants. As the data derived from these scales cannot meet the assumptions required by a parametric *t* test, observed differences between the responses of these two groups were assessed for significance using the nonparametric test equivalents of the independent *t* tests, namely the *Mann-Whitney U test*. Since these are planned comparisons rather than unplanned, the alpha level for each tests (Agricutural Sciences vs Communication Arts) was carried out with the widely accepted significance level set at .05 (2-tailed) for all tests (Hinton, 2001).

Within-subject comparisons of the four metacognitive processes in each discipline were assessed using the *Friedman test,* the non-parametric equivalents of the one factor repeated measures ANOVA. If a significant effect of 'type of metacognitive process' was found, pair-wise comparisons were made using the *Wilcoxon Matched-Pairs Signe Ranks* test*,* the non-parametric equivalents of the paired samples *t*-test, in order to determine the particular metacognitive process that differed significantly from others. The significance level (alpha level) for the *Wilcoxon Matched-Pairs Signe Ranks* tests was adjusted using the *Bonferroni method* so as to avoid inflation of the type 1 error rate.

The measurements of associations between perceptions of relevance and use of the metacognitive processes for students and between perceptions of relevance and incorporation in teaching for instructors were examined using *Spearman's Rank Order Correlations (rho)*, a non-parametric test of correlation, appropriate for ordinal data. It was assumed that a non-zero correlation existed between perceptions of relevance and use/incorporation in teaching by the instructors.

For each individual metacognitive strategy, a comparison between the two disciplines was conducted using *Gamma,* a *PRE* (propositional reduction of error) measure of association that is used when both the variables in a cross-tabulation are ordinal level. The individual strategies were rated via a *five-point Likert-style scale* and thus are considered ordinal variables. Although the subject discipline is a nominal rather than ordinal level variable because it is dichotomous (i.e., has only two categories: Agricultural Sciences and Communication Arts) it "can be regarded as being at any level of measurement" and treated "as being at the same level of measurement of the other variable being examined" (de Vaus, 2002, p. 262).

Within a subject group, the *Kendall's tau-b* measure of association was used in comparing the perceived relevance of a particular strategy with its use by students. Although other ordinal measures of association could have been used (e.g., *Gamma, Spearman's Rank Order Correlations (rho)* and *Kendall's tau-c*), *Kendall's tau-b* was chosen because it is particularly suitable for square tables where both variables have a relatively small number of categories (i.e., in this case, five each).

To examine the transfer of students' perceptions of relevance and use across the MSC and English, the *Spearman's Rank Order Correlations (rho)*, the median scores and the results of the *Wilcoxon Matched-Pairs Signe Ranks* tests were used for the metacognitive processes. For each individual strategy, the percentages of positive responses (the top two categories of the 5-point Likert scale) and the *Kendall's tau-b* coefficients were used. A transfer of positive perceptions of relevance or positive strategy use occurred only when there were high percentages for both the MSC and English (> 50 per cent) in conjunction with the high *tau-b* coefficients (> 0.50).

To examine the influence of instructors' perceived relevance of strategies on the students' use of the strategies, the instructors' 'per cent agreement' was compared to the students' 'per cent frequent use'. The 'per cent agreement' is the per cent of instructors who scored *'agree'* or *'strongly agree'* that the strategy was relevance while the 'per cent frequent use' includes the per cent of students who scored *'often use'* or *'always use'* the strategy. Similarly, the relationship between instructors' incorporation of the strategies in teaching and students' use of the strategies was examined by comparing the per cent of instructors who scored *'sometimes explicitly include in teaching'* or *'always explicitly include in teaching'* with the per cent of students who *'often use'* or *'always use'* the strategy in learning the MSC. Because only five instructors from each discipline participated in the study, only tentative conclusions can be drawn from the comparison of students and instructors' data. However, it is important to note that each instructor has a potentially large influence on students because of the dynamics of teaching environments and because of the cultural acceptance of the authority of instructors in Asian countries including Thailand (see the discussion in section 2.4.3).

Think-aloud Protocols

The results from the think-aloud protocols were not robust, therefore, the perceptions of relevance and use of the strategies resulted were used as supplementary evidence for the findings from the survey questionnaires and the self reports.

3.5.2 The Analysis of Qualitative Data

Following Strauss and Corbin (1990) and Huberman and Miles (1994), a grounded categorisation method was adopted in analyzing qualitative data in interview transcripts and self reports. The method includes three stages (Strauss & Corbin, 1990).

The initial stage of analysis, according to Strauss and Corbin, involves labelling the phenomena emerging from the data in the terms used by informants, using *In vivo* code. In order to capture insights into the learning experiences and learning strategies of students from both disciplines, the coding was performed at every level, line-unit, paragraph and text (Glaser, 1992). The words or phrases in each line or paragraph that represented knowledge about strategy utility, strategy utilization or the incorporation of the strategies was noted. The codes gained from this stage were highly descriptive and required further analysis (Goulding, 1998). The terms were changed slightly to make them more concise in later stages.

The next stage established the relationships between the codes (Locke, 1996) identified in the initial stage of coding, by examining them for similarities and differences. Terms that are more general were introduced in place of the *In vivo* codes. Different codes that described similar behaviour were renamed, using the same label. Similar codes were then grouped.

In the final stage, the categories of the codes identified during the previous coding stage were refined and validated through the final stage of coding. A search for examples of data not matching the established relationships or hierarchy was made. In so doing, the researcher went back to the original data in order to "avoid aggregation" and "preserve case configuration" (Huberman & Miles, 1994, p. 208). Some codes were renamed and some deviant codes were put into categories that are more suitable. The following sections present details of the coding and categorizing of the interview and the self-report data.

Coding and Categorizing the Interview Data

As in the case of the self-report data, three stages of categorisation were adopted from Strauss and Corbin (1990) and Huberman and Miles (1994), as described above.

This technique allows a researcher to be able to code the smallest to the largest unit of data systematically. For instance, the coding was applied at three levels – "line-up, paragraph and document units". At the line-up level, consideration of the words, phrases or sentences in each line using informants' terms were given, *In Vivo* codes. The later steps in this technique provided the guides to establish the relationship between the codes that emerged in each paragraph within and across the document. It also provided a chance to readjust the codes and their hierarchy during the process.

At the opening coding stage, the answer to an interview question was treated as a paragraph. The answers were coded in every level, that is, line-unit, paragraph and text. Table 3.4 shows the examples of coding at the line-unit and paragraph level. Apart from giving a direct answer to the question, some responses alluded to other phenomena. Therefore, paragraph level coding drew the underlying meaning of each paragraph into consideration. For example, the text sample, "Practice and experiments provide students with the authentic materials". "They face various problems and overcome them" implied that the students carried out tasks and experiments in class and dealt with a problem. This expression also indicates the informant's awareness of the utility of practice and how it provided students with opportunities to solve problems. Thus, the three codes of *PROBLEM-SOLVING, PERCEIVED RELEVANCE & INCORPORATION IN TEACHING* and *problem-solving skills* strategies were identified.

The interview guides investigated information on the informants' perceptions of strategy relevance, how students approached learning and how the strategies were incorporated into teaching the major subject content (MSC). The interview questions, including 7 open questions (OQ.) and 7 guided questions (GQ.), which addressed the following specific issues.

OQ.1 most helpful strategy; OQ.2 learning activities; OQ.3 progress achieved; OQ.4 strategies for more progress; OQ.5 lecturer expectations; OQ.6 effectiveness strategies; and OQ.7 what students have to learn.

GQ.1 pre-reviewing of concepts; GQ.2 developing effective skills; GQ.3 working on problems; GQ.4 monitoring progress; GQ.5 other strategies; GQ.6 evaluation and GQ.7 evaluation of strategies.

The allocated for each question were then collated and reconsidered. Terms that identified similar things were adjusted using the same codes. For instance, *Take the examination to get a license*; *Extra practice, Do reading; Performing a task; Accomplishing the tasks assigned* and *Student volunteered to work* were labelled *Spending extra time to study/practice*.

Learning in actual workplaces, Learning from professionals, Learning from experts, Reading different books were labelled *Accessing various resources. Learn my weaknesses; (I am) not good at work* and *(I) need-more work experience,* which identify what the informant learn about herself/ himself, were coded as *Self-assessment*. Further examples are presented in Table 3.4.

Table 3.4 Examples of the Opening Coding at Line-unit and Paragraph Level.

Paragraph Level	Communication Arts Students' Interview Data (Open Question 6)	Line-unit Level
READING/USE: Extra readings	**(OQ6) Interviewer: What do you do to effectively learn in this discipline?** CommStu F1: I *practise reading news* and *reading different books* everyday.	*Reading different books*
PLANNING/READING/USE: (goal directed)	CommStu F2: I am *practising to be an announcer*. Last year a professor asked us to *take the examination to get a license* this year. Since then I have *practised reading news* from the newspapers.	*Take the examination to get a license (assigned); Practising reading news*
USE: Practising technical skills relevant to subjects; PERCEIVED RELEVANCE: Interpersonal skills	CommStu F6: I *practise many tactics* such as *speaking strategies*, *reading out* in accordance with Thai pronunciation, *dealing with different people* and *controlling my temper*. An *irritation is an obstacle* for success. Moreover, the instructors always suggest that we have *concern for responsibility and punctuality*.	*Practising tactics such as speaking strategies,* [Obstacle for success-*irritation*] *dealing with people, controlling temper Having concern for responsibility & punctuality*
USE: Practising skills; Learning theoretical knowledge & techniques; Accessing various resources; LISTENING: Directing attention selectively	CommStu F8: Right now, I am *practising reporting the news*. I *also learn the principles of a news reporter*. I learn the *regulations of being a reporter*, *tips, theories and beliefs*, as well as *do's and don'ts techniques*. I *watch different* TV *programmes* and *study various radio programmes*. I focus on their *mistakes* and *how the professionals cope with* them.	*Having principles, regulations, tips, theories, beliefs, do's & don'ts techniques; Watching different TV & radio programmes; Learning from professionals (focusing on mistakes & how to cope with them)*
READING/USE & PERCEIVED RELEVANCE: Extra practice & reading; Doing tasks (assigned)	CommStu F11: I always do *practice* and do *readings*. I am *responsible* in accomplishing the *tasks assigned*, as is my duty.	*Practising; Doing reading*; *Showing responsibility; Accomplishing the tasks assigned*

In the next stage of coding, the codes gained from the initial coding were categorised. The relationships between the codes were established, for instance, the codes identifying activities such as informants described the advantages of their use of *asking friends; consulting experts* when dealt with a problem were PROBLEM-SOLVING/ PERCEIVED RELEVANCE & USE/READING. Similar codes were renamed – terms that are more concise were used in place of some codes. For example, *controlling temper*, *trying to freshen up* and *trying not to sleep in class* were replaced by *suppressing inappropriate thoughts/distractions*. Some codes repeatedly arose in different paragraphs. Examples of the codes and their hierarchy are presented in Table 3.5.

Table 3.5 Examples of Axial Coding.

Axial Codes	Opening Codes	
PERCEIVED RELEVANCE & USE- READING/ LISTENING: Accessing various resources; Extra reading	READING/USE & PERCEIVED RELEVANCE: Accessing various resources; Extra reading (The informants also mentioned the advantages of the strategies)	Reading books from different libraries, (Reading) different Books, Accessing the internet,
	READING/USE & PERCEIVE RELEVANCE: Extra reading (The informants also mentioned the advantages of the strategy)	Reading books every day, Reading the textbook, Do further reading
USE-LISTENING:Directing attention selectively	LISTENING:Directing attention selectively	Watching different TV & radio programmes; Learning from professionals (focusing on mistakes & how to cope with them)
PERCEIVED RELEVANCE & USE - LISTENING: Responding in class	LISTENING/USE: Responding in class (The informants also mentioned the advantages of the strategy)	Reflection on the lecture, Responding in class, Giving answers to questions, Exchanging ideas
PERCEIVED RELEVANCE & USE- LISTENING/READING: Seeking peer support	LISTENING/READING: Seeking peer support (The informants mentioned the advantages of their use of the strategy)	Asking friends, Seeking peer support, Asking seniors, Getting help from friends
PERCEIVED RELEVANCE & USE- LISTENING/READING: Asking for clarification	LISTENING/READING: Asking for clarification (The informants mentioned the advantages of their use of the strategy)	Asking friend for clarification, Asking instructor for clarification Asking for explanation
PROBLEM-SOLVING- PERCEIVED RELEVANCE & USE- LISTENING/READING: Consulting the instructor	PERCEIVED RELEVANCE & USE: Consulting the instructor (The informants mentioned the strategy both learning in class and doing a project.	Discussing with the instructor, Asking instructor for guidance, Asking instructor where to get more information

For the final stage of coding, the structure established in the axial coding was reconsidered. In order to verify the codes and establish their hierarchy, a search for the inclusion of mutually contradictory features under one code was made using the original data from both the interviews and self reports. Any discrepancy was reconsidered and rectified by renaming or regrouping. For instance, a number of different questions yielded data on what *students should do.* In the answers to guided question number 1 (GQ.1), for example, the information generally revealed the informants' perceived relevance of a specific strategy, in this case a *Planning strategy*. Some informants also mentioned what they actually did, which was strategy use. An example of such selective coding is as follows:

> Reviewing is very important. I can easily lose what I learnt without restudy [PLANNING/USE-LISTENING: REVIEWING THE LESSONS/NOTES]; [USE-LISTENING: SELF-ASSESSMENT]. It encourages my confidence that my thought and performance is right. It eases mistakes. Working is easier and can be finished on time [PLANNING/PERCEIVED RELEVANCE-READING: REVIEWING LESSSONS/NOTES].

This informant showed that s/he saw the relevance of and used reviewing the lessons/notes and these were included in the hierarchy of codes when during the axial coding. The first two sentences show that the informant used the strategy after listening to the lectures while the last part of the paragraph s/he referred to the reading. Therefore, learning contexts were inserted in each code.

Analysis of the Interview Responses on Learning Strategies

Any metacognitive process and metacognitive strategies identified were extracted from the interview data. In line with the research questions, informants' perceptions of relevance, students' use of the strategies in learning, and instructors' guidance in lectures were considered. Then, to find any relationship between these phenomena, four comparative analyses were carried out. The first two considered whether the students' use of strategies and the instructors' incorporation of strategies into their teaching related to their perceptions of strategy relevance, e.g., (1) Relevance to students vs Use by students and 2) Relevance to instructors vs Incorporation in teaching by instructors. The next two analyses considered whether there were any links between instructors' perceptions of relevance and students' perceptions and use of the strategies as well as instructors' incorporation of strategies and students' use, e.g., (3) Relevance to instructors vs Use by students and (4) Incorporation in teaching vs Use by students.

The learning strategies emerging in interview data only involved learning major subject content (MSC). While the informants detailed how they approached learning from lectures, there were relatively few references to how they coped with reading tasks. Therefore, the interview data are presented in four categories of metacognitive processes in learning the major subject content (MSC) only. The perceptions of relevance and strategy utilization when learning in the discipline by students and incorporation in teaching by instructors are presented in different categories representing the informants of both disciplines. The results are detailed in Chapter 4.

Coding and Categorizing the Self-report Data

Upon initial coding, the codes emerging from the informants' terms were utilised in the line-unit level. The underlying meanings were coded at the paragraph level. Next, coding at the text level was carried out. Examples of such codes gained from the open coding are shown in Table 3.6.

Table 3.6 Examples of the Opening Coding at Line-unit and Paragraph Level.

Paragraph Level	An Agricultural Science Student's Self Report Data	Line-unit Level
	A. Learning the major subject content	
Self-assessment	I ***enjoy learning*** many major courses. My ***favourite one*** was the one where a lecturer introduced the ***new technology that s/he had studied from different resources***.	Enjoying learning; Identifying favourite unit
Assessing knowledge/ learning	The instructor who handled that unit must not have been too strict. Some funny stories that might not relate to the lesson were told in case students were sleepy or for ***making understanding clear in class*** because students needed time to understand it.	Making understanding clear
Problem- solving	S/He had to be easy-going and have good relationship with students. Thus, they would feel able to ***ask for help*** if they faced any problems.	Asking for help
	What encouraged students' ***concentration*** and their gaining of insight was not only the interesting nature of the subject content, but also the lecturer's friendliness.	Concentration in class
Assessing Teaching & learning	I thought lecturers ***taught too fast***. They ***focused heavily on technical terms***. In many courses the professors assigned too many projects at the same time. The projects for different subjects had to be submitted on the same day.	Fast lecture delivering; Technical term focusing
Detecting weak-nesses/obstacles	This ***worried me*** so much. ***I couldn't concentrate on a lecture while I was attending a class. My mind always drifted to the unfinished work.***	Being worried; Losing concentration
	B. Learning English	
Asking for help	In reading, I would like an English instructor to ***help me with the unknown words*** and how to ***understand the meanings of the readings***.	Reading: Needing help from instructor
	S/He should ***consult the students*** who didn't understand the lesson. To study English, learners had to have interest in it.	Consulting the instructor
Detecting weak-nesses/problems	I was not pleased with my English.	
Assessing Strategy use	I ***try to understand the meaning of the words***. I still ***don't succeed***. I ***would like to know*** how to improve my writing and reading ability.	Focusing on words; Goal setting
Self-assessment	I did want to learn it because ***I was very weak in this subject***.	

At the axial stage, the strategies were categorized under the emerging situations. The relationships between the codes were established with response to the references of the situations or activities. As is evident in Table 3.6, the student used strategies such as *self-assessment, assessing knowledge/learning* and *assessing teaching & learning* when listening to the major subject lectures. These strategies are grouped as EVALUATING/USE-LISTENING. The problem-solving strategies such as *making understanding clear, asking for help and concentration in class* were seen as enhancing the understanding. Therefore, they were PROBLEM-SOLVING/PERCEIVED RELEVANCE-LISTENING. Some codes were replaced by the terms that had more theoretical relevance. See the examples of these axial coding in table 3.7 below.

Table 3.7 Example of the Axial codes.

Axial Codes	Codes from Opening Coding	
	Learning the MSC	**Learning English**
PERCEIVED RELEVANCE & USE-LISTENING & READING: Note-taking	Note-taking Taking notes what was lectured on Taking notes on important ideas Noting on the important matters Noting additional information on handouts/text book Recording the problems	Writing the meanings in Thai Noting additional information on handouts/textbooks Underlying/noting unknown words Note-taking Underlying/noting the important knowledge
PERCEIVED RELEVANCE & USE-LISTENING & READING: Concentration in class	Paying a lot of attention to the study Paying attention to lectures Concentration on what was taught	Having a lot of interest Concentration on what was taught Paying a lot of attention to what read
PERCEIVED RELEVANCE &/USE-READING:Asking for help	Asking friends for help Asking seniors for help Asking instructor for help Asking for help	Needing help from instructor Asking instructor for help Asking friends for help Seeking help from English major friends

For the final stage, selective coding was done. This involved a search for examples of data not fitting the established hierarchy using original data from both the interviews and the self-reports. Adjustments, such as renaming the codes, putting some codes in categories that are more appropriate, etc., were done. For example, the *assessing knowledge /learning* in the interview data and the *assessing knowledge/information* in the self-report were coded when respondents mentioned about what they have gained from learning. Therefore, the *assessing knowledge/information* was used. The questions and the instructions were considered in conjunction with the underlying meanings of the responses to adjust the hierarchy. The examples below were categorised as LISTENING & READING because the informant were asked to give details about how they learn to listen & read in English. Whether what they mentioned MONITORING or EVALUATING and USE or PERCEIVED RELEVANCE were considered from the underlying meanings as well as cross checked with data from the self reports.

> I didn't like English because I was not good at it [USE-EVALUATING/ LISTENING & READING: SELF-ASSESSMENT; DETECTING WEAKNESSES/PROBLEMS]. I didn't dare ask the lecturers about what I didn't understand [USE-MONITORING/LISTENING & READING: COMPREHENSION CHECK; DETECTING WEAKNESES/OBSTACLES]; [USE-EVALUATING/LISTENING & READING: ASSESSING STRATEGY USE]. I asked my friends instead [USE-PROBLEM-SOLVING/LISTENING & READING: SEEKING PEER SUPPORT]. I often ignored what I didn't understand [USE-PROBLEM-SOLVING/LISTENING & READING: IGNORING PROBLEMS].

A summary of the codes and their actual practices in learning the MSC and English gained from the interviews and/or the self-reports are available in Appendix 3.13.

When the selective coding was completed, learning strategies in each self-report were tallied. Some informants mentioned the same strategy many times in a report; in this case they were only counted once. However, if the same informant identified the strategy again in his/her second self-report, again, it was counted as one occurrence regardless of the frequency. Therefore, the strategy gained two responses from the informant.

Sometimes the same strategies were employed to tackle different tasks in different situations. Therefore, they appeared in different categories of learning strategies. For instance, a sub-strategy, *linking with prior knowledge* arose both in planning and in dealing with a problem.

Results of the above analyses are presented in chapters 4, 5 and 6.

3.6 ETHICAL CONSIDERATIONS

Through approaches used in this research, people's lives were interrupted so permission for the study was sought at various levels.

Permission from the President of Rajabhat Institute Ubon Ratchathani was gained before approaching the Faculties of Agricultural Sciences and Management Sciences. (Appendix 3.1 contains the letter seeking permission.)

Invitation letters were sent to the participants. The letters informed them of all aspects of the research project, i.e., its purposes, usefulness, nature, methods and the anticipated application of the results.

A meeting with participants was arranged. Participants were informed that the research was not part of any course that they were involved in and that they were free to withdraw from the research at any time. Furthermore, they were guaranteed confidentiality and privacy, in that; name or any other identifying feature would not identify them. Participants who agreed to become involved in the study were asked to sign a consent form. With regard to the ethical treatment of the data, videocassettes, audiocassettes, and transcripts used at the time of writing were kept secure in a locked fireproof filing cabinet, and will be destroyed 5 years after the completion of the research. The data will not be used for any purpose other than that agreed to by the participants. Finally, feedback would be provided to all subjects on request.

SUMMARY

This chapter has described the research methodology including the design, participants, instruments, data collection or procedures in gathering data and data analysis. The validity and reliability of the instruments and credibility of the study were also addressed. In addition, the integration of the findings from all approaches was demonstrated.

In the next four chapters, the results of the interview, self-reports, survey questionnaires, the observation data, as well as the further literature review on metacognition theory in EFL/SLA will be presented.

4. STRATEGIES IN LEARNING MAJOR SUBJECT CONTENT: RESULTS FROM THE INTERVIEWS

OVERVIEW OF THE CHAPTER

This chapter reports on the informants' responses to the interview guide. Overall results from the interviews are presented initially as they provide the context for learning in the two disciplines as well as details of how the informants perceived relevance and how they actually use metacognitive strategies. Following the presentation of the method of interview data elicitation, a brief overview of the data analysis is described. The instructors and students' responses regarding the metacognitive strategies of each domain are given, and then the comparative analyses are presented. Finally, there is a discussion of the findings.

4.1 ELICITATION OF INFORMATION THROUGH INTERVIEWS

The one-on-one interview, a popular qualitative means, was utilised in order to further the investigation of metacognitive strategies embedded in teaching and learning and those used by the students in learning their discipline subjects. The investigation extended to how instructors' perceptions on this matter influenced their teaching and their students' strategy utilization. Overall, twenty-nine informants—11 students of Agricultural Sciences and 8 of Communication Arts and 10 instructors (5 from each discipline) volunteered to participate in the one-on-one interviews.

The interview guides for both groups of informants included open-ended and guided questions. The instructors and learners responded to separate sets of questions. Each of the interview guides contained fourteen parallel questions, seven open-ended and seven guided ones. The open-ended questions investigated teaching and learning in the relative disciplines and how the students approached the discipline subjects. The guided questions elicited knowledge about metacognitive strategies. Copies of these interview guides are presented in Appendices C and D respectively.

In collecting data, every participant was asked to provide two self-reports one month apart. For those who did not volunteer to do the think-aloud protocols and interviews were requested to respond to the questionnaires immediately after preparing the first report. The volunteer informants were asked to undertake the interview before providing their second self-report. The interviews were conducted after an appointment was made and took place in a studio that was a familiar environment for the informants. The first five minutes were spent on building rapport with the interviewees. The duration of the interviews varied from about 12-25 minutes, depending on the amount of information each informant gave. During the interviews, listener feedback such as facial expressions and expressions like “Right”, “Yes”, “What’s next?” and/ or “How?” were provided in order to prompt the informants to give further details. These listening behaviours are appropriate when speaking in Thai. If an informant stopped talking or was silent for ten seconds after being urged, the next inquiry was made.

The recorded interviews were transcribed and sent to the informants for confirmation. I then translated them into English. An expert English language instructor and my supervisor (see names in Appendix B) checked the correctness of the language.

4.2 INTERVIEW DATA ANALYSIS

The focus of the interviews was on the application of metacognitive strategies in learning the major subject content (MSC). However, a few of the students and instructors also gave examples of how they apply particular metacognitive strategies in learning English. The students’ interview scripts were analysed for evidence of their discernment of the relevance of metacognitive strategies and the consequence of this knowledge, that is, whether or not students actually used the strategies (see details in Chapter 3). The instructors’ responses were analysed to determine their perceptions of the relevance of metacognitive strategies and their awareness of students’ use of the strategies in learning the MSC. Evidence of the instructors’ incorporation of metacognitive strategies in their teaching practice was also sought.

The findings are organised and presented according to the major subject areas. That is, perceptions of relevance and strategy utilization by students in learning MSC, and incorporation in teaching by instructors are presented in that order. Separate sections are also devoted to the associations between these three areas, namely: relevance to students and use by students; relevance to instructors and use by students; and evidence of instructors’ influence on students’ use of strategies. Within each of these major sections, the four overarching categories of metacognitive processes (i.e., planning, monitoring, problem-solving and evaluating) are considered separately. Figure 4.1 provides an overview of the presentation of the results.

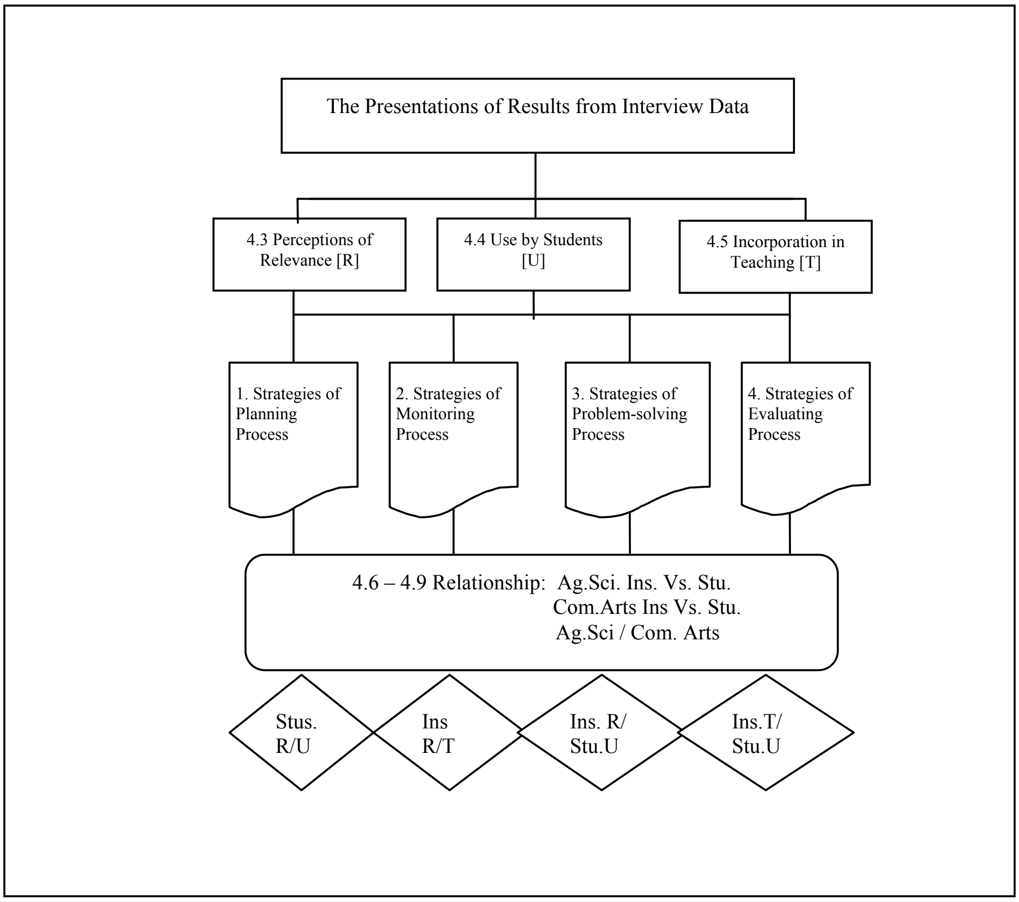

Figure 4.1 Presentation of results from the interview data.

4.3 PERCEPTIONS OF RELEVANCE

In giving responses to specific open and guided questions, informants often provided evidence of their knowledge about other issues regarding teaching and learning tasks and strategies. For example, although some informants only stated what was useful, others identified advantages/disadvantages or how strategies enhanced or obstructed their learning/teaching, knowledge, ideas and work. The following excerpts are examples. The relevant metacognitive strategies are identified in square brackets and upper case.

> … In practising to be a reporter, pronouncing cluster r and l is very important (in Thai). Reading correctly and clearly must be concentrated on. These must be kept in mind [PLANNING: PRE-REVIEWING CONCEPTS]. While I am practising I try to avoid making such mistakes [PLANNING: DIRECTING ATTENTION SELECTIVELY]. Thus, my announcing is better. [EVALUATING: SELF-ASSESSMENT; ASSESSING STRATEGY USE] (CommArtsStu F2)

As seen above, perceptions of the relevance of strategies are mentioned in terms of its importance, its advantage or disadvantage of not using. In this case, the student mentioned the importance of accuracy and clarity of pronunciation and reading in practising to be a reporter.

Also she made a reference of the advantage of strategies. This was therefore considered as evidence of use of strategies such as the *directing attention selectively* strategy and the *pre-reviewing concepts* strategy.

Informants in the given disciplines either directly or indirectly mentioned perceptions of a variety of general learning strategies and metacognitive strategies. The following sections identify four specific processes of metacognitive strategies that came up in the interviews.

4.3.1 Strategies of the Planning Process

Perceptions of the relevance of a considerable number of *Planning strategies* were detected from informants (instructors & students) in the given disciplines. Examples are as follows:

Suebsak, a student in **Agricultural Science**, explained that the most fundamental courses called for attending lectures, so he needed to listen to the lessons and take notes. He thought that attending lectures, studying materials and notes in advance [PLANNING: PRE-READING] and reviewing them after class were the most helpful ways of learning in this discipline [PLANNING: SPENDING EXTRA TIME TO STUDY/PRACTISE]. He also showed a recognition of the planning strategy in his statement:

> Reviewing helps prepare me to be ready to proceed with a task [PLANNING: PRE-REVIEWING CONCEPTS]. When performing the tasks, I can get more insight into what I am doing. Besides, the chance to improve the work quality is widened and therefore also the chance to be successful.

Suebsak also mentioned that Agricultural Science tasks included planting and grafting work in the gardens and laboratory tasks such as testing soils. He decided that he must show interest in theoretical knowledge as well as being actively involved in practical tasks [PLANNING: CONCENTRATION IN CLASS]. However, he realised that 9 out of the 15 credits needed for his course were for practical sessions and he intended to focus most of his interest on these [PLANNING: DIRECTING ATTENTION SELECTIVELY].

Teerasak, an instructor in Agricultural Science, stressed the importance of students doing more self-study [PLANNING: SPENDING EXTRA TIME TO STUDY/ PRACTISE] and paying more interest in class or laboratory practice [PLANNING: CONCENTRAION IN CLASS]. He said, "They (students) should really listen to lessons and respond to the questions" and that students were expected to perform laboratory tasks in accordance with the theoretical knowledge taught. At the beginning level, they were supposed to be able to set up the laboratory instruments and carry out experiments under guidance. At the advanced level, they were expected to design and carry out their own projects based on the topic assigned. He noted the relevance of these strategies by saying, “I am sure they can improve if they pay more attention. They can do much better if they do more self-study”. These strategies fit under the *Planning* process as they report thinking, doing before a particular activity, task, or class.

Instructors and students in **Communication Arts** also provided several *Planning strategies* that they thought relevant to learning the MSC. Jintana, one of the **Communication Arts** students, was displeased with her own grade. She realised that to be a good student meant she was supposed to listen to lectures attentively and respond to instructors when needed. She said, “I can do better if I am more diligent, pay more attention [PLANNING: CONCENTRATION IN CLASS], read more and do more self-study” [PLANNING: SPENDING EXTRA TIME TO STUDY/PRACTISE]. She also thought that reviewing specific concepts before proceeding with a task would bring about development [PLANNING: PRE-REVIEWING CONCEPTS]. Jintana stressed keeping in mind to avoid mispronunciation, “Thus, my announcing is better.” She also claimed that she learned more, knew more and understood more when she reviewed concepts.

Nattawut, also a student in this field, thought that strategies such as doing more reading [PLANNING: EXTRA READING] and reviewing theory [PLANNING: PRE-REVIEWING CONCEPTS] could help his learning. He thought that learning only within a class was insufficient and that learning from real life situations, such as at a TV/radio relay station or from a TV/radio programme, was so valuable that every student should concentrate on it [PLANNING: SPENDING EXTRA TIME TO STUDY].

In the meantime, Spunna, one of their instructors, also recognised the relevance of *Planning strategies* and thought that learners should study, listen or watch different programmes [PLANNING: ACCESSING VARIOUS RESOURCES] before writing up a script of their own programme [PLANNING: PRE-REVIEWING CONCEPTS]. She said learners had to look for good resources, such as key persons and relevant documents, and they had to know from which resources they could get concise information on the latest issues [PLANNING: MANAGING RESOURCES]. They also had to weigh up the effect of a news report or programme, e.g., whether it would have positive or negative consequences in the community [PLANNING: PREDICTING OUTCOMES/CONSEQUENCES].

4.3.2 Strategies of the Monitoring Process

Some informants showed their recognition of *Monitoring strategies.* For instance, Sutus, a student in **Agricultural Sciences**, thought that checking progress [MONITORING: CHECKING PROGRESS] was helpful. He reported monitoring a project he had done at home. He said that knowing that he had made progress motivated him to keep going. He added, “I was very pleased with the progress of my work” [MONITORING: SELF-EXAMINATION].

Wuttipong, one of instructors in this field, reported monitoring his students' progress in learning, for example in breeding fish, [MONITORING: CHECKING PROGRESS] and helped them in checking their flaws [MONITORING: SELF-EXAMINATION]. He recalled that students could focus more on what they did as a result. In this case, it was how to breed an optimal number of healthy fish at a low capital cost. In his view, this increased the quality of the work.

Similarly, Duanghathai, a **Communication Arts** student, knew now what she had done and would do in relation to the requirements of the programme [MONITORING: CHECKING PROGRESS]. She said, "I had to learn and practice more in writing scripts and to be a good public communicator. Now, I would like to learn more about how to broadcast a programme". She explained that this knowledge inspired her to keep on learning, keep on working, and to go further with her studies. Moreover, she reported that checking her progress prevented her from getting discouraged.

Wanwipa, an instructor who taught language use for Communication Arts careers, provided her students with opportunities to practise standard Thai. Recognising that dialect accent was the main obstacle for her students; Wanwipa always monitored and guided them to check their pronunciation [MONITORING: SELF-EXAMINATION]. She said, "Monitoring is regularly used in this discipline." She reported guiding students to make use of the strategy of self-reflection in order to improve themselves. She explained:

> Generally, students are timid. With this technique they can overcome their shyness. They recognise their own flaws, know how to redeem and amend them. Gradually, they show improvement, that is, they become more bold.

4.3.3 Strategies of the Problem-solving Process

Informants in the given disciplines made reference to several strategies they thought relevant for overcoming an obstacle in learning major subject content.

Samapol, a student in **Agricultural Sciences** who spent his free time volunteering to help the instructors with extra tasks or to work on a farm, said, "I try to deal with problems by myself" [PROBLEM-SOLVING: SOLVING IT ALONE]. He reported doing what he thought was best and he stated that, "Appropriate alternatives help improve my efficacy" [PROBLEM-SOLVING: TRYING OUT ALTERNATIVES]. As a result, he learned to think before carrying out a task, for example, when dealing with animals he had to be both tender and active. He stressed that when he succeeded he was pleased and this was his motivation. When he failed, he kept on trying [PROBLEM-SOLVING: EFFORT DIRECTED], for example, "When I fail, I still keep on looking for a suitable way to make it out". He explained, for instance, that once a cow that he and a few friends tended did not produce milk. They tried to solve the problem by checking whether it was infected by any disease or had an udder inflammation. They found neither infection nor inflammation. They consulted peers, instructors and veterinarians. They tried alternatives suggested by others such as checking the food and vaccinations, but could not find a cause. Finally, they got advice from an elderly neighbour who suggested that they try using a newborn calf to prompt the cow to produce milk and it worked.

Sarayuth, an instructor in Agricultural Sciences, thought that to work on problems by oneself [PROBLEM-SOLVING: SOLVING IT ALONE] was helpful. He said when students studied a wide range of knowledge; they gradually used it to consider the best way to deal with a problem [PROBLEM-SOLVING: LINKING WITH PRIOR KNOWLEDGE]. For instance, students had to apply biology, soil sciences, chemistry and environmental sciences when grafting plants, preparing soils and preparing bio-insecticides. The latter they had to schedule spraying in order not to cause chemical contamination in growing plants. He stressed:

> Working on problems helped students improve themselves. It was also useful even when they failed to solve a problem. They could learn from their failure and look for other ways to overcome it [PROBLEM-SOLVING: TRYING OUT ALTERNATIVES].

Tarinee, a **Communication Arts** student, reported practising in TV studio and radio relay stations as well as visiting actual workplaces. Observing how professionals cope with their tasks and/or working with them helped her when dealing with problems and enhanced her self-confidence. She was more sure of herself when solving a problem. She said if she could not solve something she would consult others or try other ways [PROBLEM-SOLVING: SEEKING PEER SUPPORTS]; [PROBLEM-SOLVING: TRYING OUT ALTERNATIVES]. For example, she realised that learning in class was insufficient. She sought ways to improve herself by studying before class, sharing ideas with classmates or visiting actual work places. She said,

> The instructors are likely to focus on theories. However, they (students) should change their learning habits by studying by themselves. Going to visit actual work places shows the differences between the work sites and the laboratory; for example, we learn where the suitable spot is to place a microphone.

Sihanart, Suwaluck and Wanwipa, Tarinee's instructors, agreed on the importance of their students being able to deal with a problem either alone or in groups. Sihanart said it was the key for a learner-centred approach. If learners were unable to overcome obstacles by themselves [PROBLEM-SOLVING: SOLVING IT ALONE], they would hardly achieve what they needed to. He added that working through problems helped one reach a goal, and in this case, to gain the information needed to be prepared for that problem next time.

Suwaluck also explained that some fields might have only one correct solution, but in Communication, there would be various solutions. In real circumstances, students would face unexpected hindrances. Wanwipa stressed that when working in this discipline, students needed to be skilful in solving problems [PROBLEM-SOLVING: TRYING ALTERNATIVES]. Highly successful professionals had this talent.

4.3.4 Strategies of the Evaluating Process

The informants in the two disciplines reflected that, after completing part of or an entire project, they checked on how well they carried out the task and how the strategies helped in doing the work in gaining results. These perceptions of the relevance of *Evaluating strategies* were extracted from the responses to both open-ended and guided questions. The following paragraphs provide examples.

Chaiyasit, a student in **Agricultural Science**, reported assessing his own work [EVALUATING: ASSESSING LEARNING/WORK]. He said he did this when producing bio-fertilizer, grafting or doing other tasks, for example, "Evaluation helps me see my work is progressing and its results". Wuttipong, one of Chaiyasit's instructors, reported assigning projects involving aquaculture. He explained that students had to study additional materials in the sciences such as biology, chemistry, genetics and mathematics for these projects. He added that students had to make connections between these disciplines and refine their technical skills to carry out projects [EVALUATION: REFINING IDEAS /SKILLS]. He explained the relevance of these strategies by stating, "If the results are not as indicated in the theories, students then learn that working in a different environment gives different results. They eventually learn to apply the theories in other contexts" [EVALUATION: OTHER AREA APPLICABILITY]. He added, "Thus, making use of the strategy of making connection and refining knowledge/skills helps them complete the tasks more easily."

Juree, a student in **Communication Arts**, found that categorising materials and connecting related ideas [EVALUATING: REFINING IDEAS/INFORMATION] was very helpful. She found that when studying in the library with no instructor around, she was alone with piles of books and did not know how to manage the ideas and information from all the different resources [PLANNING: MANAGING RESOURCES]. She would become overwhelmed and not do anything. She realised that developing skills in categorising materials and connecting ideas saved time in planning. She also said that:

> Developing these skills saves us time in planning when doing different tasks such as in a group work. To think logically prevents us from delaying others. Also group members might waste their time or money if we lack these abilities.

However, she still thought that she needed to practise these techniques.

Suwaluck, an instructor in this field, thought that weighing up, considering and criticising information from different resources and applying their knowledge helped make learners develop more accuracy with their information [EVALUATING: ASSESSING KNOWLEDGE/INFORMATION]; [EVALUATING: WITHIN SUBJECT APPLICABILITY]. She indicated the relevance of these strategies by stating, "Through this process, students experience thinking critically and planning. This eventually enhances their success."

4.4 USE BY STUDENTS

There was some evidence in both instructors' and students' responses that metacognitive processes were not only perceived as relevant, but also used by the students in the two fields.

The following sections present details of strategies for the four metacognitive processes actively used by students in learning their MSC.

4.4.1 Strategies of the Planning Process

There were several strategies that informants (instructors & students) suggested students before carrying out a task or an activity. Such strategies fit under the *Planning* process.

Pornsak, one of the **Agricultural Science** students, used different *Planning strategies* when doing a project. For example, he and some friends had planned an aquaculture project [PLANNING: MAKING A PLAN], but they did not simply decide what kind of fish they would breed, those for food or those for pleasure. They consulted an instructor and studied additional information [PLANNING: EXTRA READING] such as effective breeding techniques [PLANNING: GOAL SETTING]. They looked at information from experts at related public departments and in documents in the library or on the Internet [PLANNING: ACCESSING VARIOUS RESOURCES]. Pornsak said they planned to put what they had learnt into practise in the project [PLANNING: PRE-REVIEWING CONCEPTS]. In planning, he reported thinking in advance about what to do first and what to do next [PLANNING: WORK ORDERING]. He explained:

> I think in advance how long the project takes [PLANNING: MAKING A TIME FRAME] and how much money is needed and even how much to spend on it during the next week [PLANNING: MANAGING RESOURCES].

Rinnaree, a lecturer in Agricultural Science, reported creating real-life farm work practice for students. She explained that students had to stay on campus and do early morning and evening milking, as well as feeding and treating the cattle. They had to do accounting as well as marketing. She noticed that some students *spent extra time studying and practising*. She said:

> The students who are eager to learn volunteer to do some more work on the farm apart from the assigned work [PLANNING: SPENDING EXTRA TIME TO STUDY/PRACTICE]. They like to learn more and they realize the advantages of practice.

Rungmanee, a student in **Communication Arts**, described learning theoretical knowledge from lectures. She said she took notes while attending class, particularly on what was puzzling [PLANNING: DIRECTING ATTENTION SELECTIVELY]. This strategy was also reflected in her description about learning. She said that to develop good public relations with audiences she had to be able to broadcast accurate information. In so doing, she said:

> We (students) must actively catch up on events. We must be patient and work hard. Moreover, we must be accurate. The reporting must be attractive, clear and concise [PLANNING: DIRECTING ATTENTION SELECTIVELY].

Therefore, Rungmanee sought ways for better understanding and improvement by using strategies such as *pre-reading, spending extra time to study/practise* and *accessing various resources*. She said "I review them (the notes) and do further study in the library by myself, without any instruction" [PLANNING: SPENDING EXTRA TIME TO STUDY/PRACTICE]. She claimed that whenever she studied before class [PLANNING: PRE-READING], she could understand the lecture better. She stressed that, "we should study more in the library and from other related materials" [PLANNING: ACCESSING VARIOUS RESOURCES].

Dara, a lecturer in Communication Arts, reported that her students made use of *Planning strategies* such as *sequencing the work* and *linking to background knowledge* in doing things such as taking examinations. She said, "They draw on their own experiences in doing the tests and get very good grades [PLANNING: LINKING WITH PRIOR KNOWLEDGE]. In their work they express confidence, bold decision making and good organization" [PLANNING: WORK ORDERING].

4.4.2 Strategies of the Monitoring Process

Students in the two disciplines used a number of different strategies to check or measure their own performance and capabilities while they were studying or working on a task. Such strategies fit under the *Monitoring* process.

In talking about learning in the **Agricultural Sciences**, Samapol referred to his use of *Monitoring strategies* such as *self-examination, detecting the problem* and *checking progress.* He said that he normally attended lectures. He sometimes also did workshops and farm work as well as laboratory practice, but not frequently. He stated:

> I am quite pleased with my study. I think I can do better, but I am trying. I do additional study by myself]. I also check my progress from the GPA[3] [MONITORING: CHECKING PROGRESS]. Monitoring progress encourages my self-awareness. I learn what I have done and how I can put this to use in the future [EVALUATING: ASSESSING STRATEGY USE]; [EVALUATING: OTHER AREA APPLICABILIT]. I also learn my flaws and try to improve myself accordingly [MONITORING: SELF-EXAMINATION; DETECTING WEAKNESSES].

Samapol also said that he liked searching the Internet [MONITORING: SELF-EXAMINATION] and preferred using the University of Agricultural Sciences homepage. He explained that having these skills saved him money and time[4], and would also be very helpful in his future life [EVALUATION: JUDGING WORTHINESS OF LEARNING].

As seen above, informants showed that different strategies were used in monitoring, and that the use of one strategy leads to another.

Rattana, who was studying **Communication Arts**, showed her use of *Monitoring strategies* while explaining ways to solve a problem. She said:

> I do not hold onto a single tactic but try new perspectives. That is, if this doesn't work, I try new ways [MONITORING: DETECTING PROBLEM]; [MONITORING: CHECKING EFFECTIVENESS OF THE STRATEGY BEING USED]. For example, if I don't gain sufficient data from here [MONITORING: CHECKING RETRIEVAL OF REQUIRED INFORMATION], I then look in other resources [PROBLEM-SOLVING: ACCESSING VARIOUS RESOURCES].

Interestingly, the use of these strategies was evident only in the students' transcripts. Although all instructors in both disciplines noted the relevance of some *Monitoring strategies* (see section 4.3.2), none specifically noted their students' use. But this is not surprising. Monitoring is an introspective activity which lecturers need not observe or know about.

4.4.3 Strategies of the Problem-solving Process

Overall, wide varieties of Problem-solving strategies were used by students as evidenced in interviews with both groups of informants in the two disciplines. Some students reported using a number of different strategies to deal with a problem, that is, one strategy after another until an obstacle was removed. These strategies fit under the *Problem-solving* process.

Chaiyasith, an **Agricultural Science** student, reported that he faced some problems while doing a project. He sometimes succeeded in solving them and sometimes failed to do so

[3] GPA refers to the grade point average.
[4] In doing a project, students need to pay for some project resources such as TV/radio cassette tapes or a relay station time rent fee (Communication Arts), chemical solutions, fish or plants (Agricultural Sciences).

[PROBLEM-SOLVING: SOLVING IT ALONE]. For example, he gave an example of when he had wanted to force a mango tree to bear fruit out of season. He tried using different kinds of commercial hormones and fertilizers. He reported preparing the hormones by using different herbal extracts, and trying various other alternatives [PROBLEM-SOLVING: TRYING ALTERNATIVES] such as making different bio-fertilizers from plant crops and adjusting some of the techniques or steps in the procedure [PROBLEM-SOLVING: ADJUSTING METHODS/TECHQUES] in order to increase the quality of his experiments. When faced with failure he explained:

> Failure showed me my flaws [MONITORING: DETECTING WEAKNESSES], but it inspired me to do further study [PROBLEM-SOLVING: EXTRA READING] and look for new remedies [PROBLEM-SOLVING: LOOKING FOR SOLUTIONS].

Rinnaree, one of instructors in Agricultural Sciences, reported providing students with opportunities to practise producing better products regarding animal health. With in real life practice, “they (the students) have opportunities to face authentic problems and try to solve them”. She described the types of obstacles that the students had to deal which included a chemical limitation in meat products or a price drop caused by over supply. Her supervision of learners doing apprenticeships also revealed many problems occurring within the organisations or with the students, such as discrepancies between instruments and technical skills at workforces and those learned at the university, and expectations of students’ responsibility and/or quality. She stressed that most students experienced these work problems, but she noticed that most students could overcome these obstacles by themselves [PROBLEM-SOLVING: SOLVING IT ALONE]. However, she said, “If the problem was too hard for them, they always asked for help” [PROBLEM-SOLVING: ASKING FOR HELP].

In dealing with a lecture comprehension problem, Jintana, a student in **Communication Arts**, sought help by asking friends for clarification [PROBLEM-SOLVING: SEEKING PEER SUPPORT]; [PROBLEM-SOLVING: ASKING FOR CLARIFICATION]. She thought that this was one of the most helpful ways to learn in this discipline. She also said that if she was too timid to ask the instructor during the class, she noted down her questions and asked him/her after the class [PROBLEM-SOLVING: CONSULTING THE INSTRUCTOR].

Sihanart, an instructor in Communication Arts, described the difficulties students faced which included time limits and/or distance from resources. He noted that accessing accurate knowledge was very useful, but sometimes students could not access the appropriate information. So to work out a problem, learners sometimes asked instructors for help [PROBLEM-SOLVING: CONSULTING THE INSTRUCTOR]; [PROBLEM-SOLVING: ASKING FOR HELP] or made use of other resources such as more experienced people from different sectors (public or private) or relevant materials [PROBLEM-SOLVING: ACCESSING

VARIOUS RESOURCES]. Sihanart felt that a lack of confidence often hampered students and it was difficult to get them to realise that they could successfully work problems out by themselves without the lecturer's help. However, once they had experienced success they were pleased, and gradually relied more on their own problem-solving skills [PROBLEM-SOLVING: SOLVING IT ALONE].

4.4.4 Strategies of the Evaluating Process

The interview data provided some evidence that students assess their performance or results and look for ways to improve. These strategies fit under the *Evaluating* process.

Sutus, a student in the **Agricultural Sciences**, described his use of different *Evaluating strategies*. He said, "I have introduced the idea of sustainability to my parents and I apply what I have learnt to my daily life" [EVALUATING: OTHER AREA APPLICABILITY]. For example, he reported relating knowledge gained from library or other sources to what he already knew [EVALUATING: REFINING IDEAS/ SKILLS]. He also described applying knowledge about grafting and soil science to increase crop productivity. He reported, in most cases, transferring learning within his subject area, such as using his own knowledge about animals to learning animal husbandry. He said:

> For example, in studying biology we have to go deep into the components of plants and animals. I apply this knowledge to my major units such as Poultry [EVALUATING: OTHER AREA APPLICABILITY].

He claimed that sometimes he evaluated the effectiveness of a strategy he had used, "I have compared the results of my reviewing and found that frequently doing so increases my understanding. Thus, I try to do it more often" [EVALUATING: ASSESSING STRATEGY USE]; [EVALUATING: REFINING IDEAS/SKILLS].

Sarayuth, an instructor in Agricultural Science, noticed that those learners who had a strong interest in the field were able to fully concentrate on lessons and implement them in practice [EVALUATING: WITHIN SUBJECT APPLICABILITY]. These students proved that they possessed technical skills as well as sound theoretical knowledge and, "They also apply what they have learned at university to their daily lives" [EVALUATING: OTHER AREA APPLICABILITY].

Molwipa, who was studying **Communication Arts**, spoke about her practical experience in producing commercial advertisements and operating spot recorders, and indicated that she used some *Evaluating strategies.* For example:

> I study different materials, then, weigh up and criticize the information [EVALUATION: ASSESSING KNOWLEDGE / INFORMATION] and make

> use of this in my work [EVALUATING: WITHIN SUBJECT APPLICABILITY].

Sihanart, an instructor in Communication Arts, noted that third and fourth year students was able to complete their assignments (e.g., projects) by themselves. He went on to explain that before submitting a project the students were able to summarize its advantages and disadvantages [EVALUATING: ASSESSING LEARNING/WORK] and identify any obstacles they had met, how they had overcome them as well as whether they succeeded [EVALUATING: ASSESSING STRATEGY USE]. He believed that they learned a lot from the process of working problems out. He also expressed confidence that these students would make use of these *Evaluating* strategies in the future.

4.5 INCORPORATION IN TEACHING BY INSTRUCTORS

4.5.1 Strategies of the Planning Process

There was some evidence of inclusion in teaching of strategies that encouraged students' thinking or performance before carrying out a prescribed task. The following examples were perceived by both students and instructors in the two disciplines.

Rinnaree, an **Agricultural Science** instructor, identified how she helped prepare her students to do a task indicating that she incorporated *Planning strategies* such as *managing resources* and *goal setting* into teaching. She said:

> Before assigning the students to investigate the price of farm produce, we discuss markets - where to investigate them and which items of produce are in demand, the price in different markets, and the reasons why the prices are different [PLANNING: MANAGING RESOURCES]; [PLANNING: GOAL SETTING].

Rinnaree also reported trying different ways to prepare her students to be self-reliant and able to run their own farms. That is, she assigned them a self-study project on what interested them and provided them with opportunities to get real-life experiences like farm work on campus [PLANNING: SPENDING EXTRA TIME TO STUDY/PRACTICE].

Rattana, a **Communication Arts** student, described how her instructors included *spending extra time to study/practise a strategy* in their teaching through assigned projects. She explained how her instructors transferred *managing resources* and *goal setting* to students. She said, "The lecturers suggest to us how to and where to gather the information [PLANNING: MANAGING RESOURCES]. They explain what they want us to look for" [PLANNING: GOAL SETTING].

Dara reported that in teaching a unit in Communication Arts, she used a work sheet as a tool for guiding her students to *set a goal*, *make a plan* and *make a timetable*. She said,

> As far as I am concerned, learners cannot get all the ideas on how to do assignments. To prevent them from missing some important points I give them each a hard copy of directions and tell them what they are expected to do [PLANNING: GOAL SETTING]. Through the work sheets, I show them how to plan in accordance with the submission date of each assignment [PLANNING: MAKING A PLAN]; [PLANNING: MAKING A TIME FRAME].

4.5.2 Strategies of the Monitoring Process

There was also evidence of the incorporation in teaching of strategies that provided students with opportunities to measure their own performance on tasks. The inclusion of these *Monitoring strategies* was reported by instructors, although students noticed only limited strategies included in the teaching.

Samapol, an **Agricultural Science** student, indicated that his instructors modelled a *Monitoring strategy*. He said:

> I regularly discuss things with instructors. They always give feedback on my job. Their comments prompt me to find out my faults [MONITORING: DETECTING WEAKNESES/OBSTACLES].

Teerasak, one of the instructors in Agricultural Sciences, reported modelling some *Monitoring strategies*:

> While learners are doing a laboratory task, I look for how a scientist would perform his task. For example, he must have a high level of discipline, be patient, be clean and be well organized. Besides, the scientist must present a quality study. I always remind them of this [MONITORING: DISTINGUISHING APPROPRIATENESS FROM INAPPROPRIATENESS]. I also check their laboratory skills, whether they can do a task by themselves, whether they see what they are looking for, or whether they find out the answers [CHECKING RETRIEVAL OF REQUIRED INFORMATION]; [MONITORING: CHECKING WHETHER THE GOAL HAS BEEN MET].

Rattana, a **Communication Arts** student, indicated that her instructors embedded *Monitoring strategies* in their teaching:

> Work includes keeping within limits. For example, in the commercial advertisements concise expression is the key to success. We learn which words to cut, which words to retain, or omit [MONITORING: CHEKING THE IMPORTANCE OF INFORMATION]. We learn “dos” and “don’ts” and we avoid the “don’ts” [MONITORING: DISTINGUISHING APPROPRIATENESS FROM INAPPROPRIATENESS].

Suwaluck, a Communication Arts instructor, said that she used to monitor her learners' progress and inform them of their strengths and weaknesses [MONITORING: SELF-EXAMINATION], but now she guides them to do this themselves [MONITORING: CHECKING PROGRESS]. Now they have to compare their results with previous efforts and see whether they have fewer weaknesses or not [MONITORING: DETECTING WEAKNESS]. This, she said, showed their progress.

4.5.3 Strategies of the Problem-solving Process

Only some strategies of the *Problem-solving* process were reported by instructors in both disciplines.

When asked about the relevance of working on a problem (GQ.3), Teerasak, a lecturer in **Agricultural Sciences**, explained that he helped his students to solve a problem in their experiments by considering ways to cope with it, and how to get the answers [PROBLEM-SOLVING: LOOKING FOR SOLUTIONS]. In so doing, he explained, "They (the students) need to be flexible, that is, to change to alternatives if one does not work" [PROBLEM-SOLVING: TRYING ALTERNATIVES]. Rather than promote the benefits of a strategy explicitly, he integrated them into his teaching. He said:

> They (the strategies) are blended into the teaching-learning process. I am likely to use the question, "This one doesn't work, so which one should be replaced" in order to get rid of obstacles and help students achieve their goals [PROBLEM-SOLVING: TRYING ALTERNATIVES].

Spunna, a lecturer in **Communication Arts**, also included some *Problem-solving strategies* in her teaching. When her students faced a problem in producing or broadcasting a programme, she explicitly guided them in finding out solutions. She explained:

> I really listen to what they say about their problems. I guide these students closely to be able to work the problems out by themselves [PROBLEM-SOLVING: SOLVING IT ALONE]. I guide them as to how to find out the solutions [PROBLEM-SOLVING: LOOKING FOR SOLUTIONS]. I provide them with examples and teach them how to gather essential information [MONITORING: SEEKING RELATED KNOWLEDGE].

In addition, the students could also consult an instructor if they failed to solve a problem alone [PROBLEM-SOLVING: CONSULTING THE INSTRUCTOR].

4.5.4 Strategies of the Evaluating Process

There was some evidence provided by both students and instructors that strategies encouraging learners to evaluate their own learning behaviours and knowledge were incorporated into the lectures into teaching in both Agricultural Sciences and Communication Arts.

Rinnaree, an Agricultural Science instructor who taught animal sciences, revealed that she included some *Evaluating strategies* in teaching. Some strategies were made explicit to the students, as is evident in the following statement:

> I assign a self-study project and train them to analyse and evaluate it [EVALUATING: ASSESSING LEARNING/WORK]. They work in groups and take turns pointing out which part is interesting or which is not. Which is important which is not [MONITORING: DISTINGUISHING APPROPRIATENESS FROM INAPPROPRIATENESS].

Rinnaree also disclosed how some other strategies were embedded in tests or assignments that she set. In an assignment requiring students to survey local crop markets, she suggested that they find out "…what benefits they gained from the survey". Thus, she required her students to assess the relevance of their work [EVALUATING: ASSESSING THE WORK].

Suwaluck, an instructor in Communication Arts, reported including the *applying knowledge to practice* and *assessing knowledge/information* strategies of the *Evaluating* process in her teaching. She noted the importance of having accurate information and therefore suggested to her students to "think out, consider or weigh and make use of the information they have gained" [EVALUATING: ASSESSING INFORMATION/KNOWLEDGE]; [EVALUATING: WITHIN SUBJECT APPLICABILITY].

4.6 RELEVANCE TO STUDENTS AND USE BY STUDENTS

There was some evidence in the interviews of a relationship between students' perceptions of relevance of a strategy and its subsequent use. This occurred in all four metacognitive processes studied in this thesis: *Planning, Monitoring, Problem-solving* and *Evaluating*. This evidence was extracted from the data when there was clear mention of the use of a strategy that students also considered important, helpful, valuable etc.

4.6.1 Strategies the Planning Process

There was some evidence that students in the two disciplines actually used the strategies of the *Planning* process that they perceived as relevant. For example, in **Agricultural Sciences**, Nuntana**,** reported reading complementary or related documents before attending lectures [PLANNING: PRE-READING] and sometimes studying with friends before taking an examination [PLANNING: SPENDING EXTRA TIEM TO STUDY/PRACTICE]. This appears to relate to her perceptions of relevance. For instance, she had previously noted the important of perceptions, e.g., “Reading before attending a class and taking an examination may help me learn quite well and get a good mark.”

Another instance of this relationship is evident in the interview of Juree, a student in **Communication Arts**. She reported that it saved time to prioritise what to do first and what to do next [PLANNING: WORK ORDERING]. She reported *spending extra time to study/practise* and *accessing various resources* strategies:

> I don’t think just learning in class is sufficient. I try to join extra activities or study by myself in the libraries. I think I can more easily gain information and better broaden my knowledge through attending seminars and meetings, learning from seniors, and discussing with experts or professionals [PLANNING: SPENDING EXTRA TIME TO STUDY/PRACTISE]; [PLANNING: ACCESSING VARIOUS RESOURCES].

4.6.2 Strategies of the Monitoring Process

Only a few of the informants discussed monitoring strategies in a way that demonstrated a possible link between perceived relevance and actual use.

Rujee, a student in **Agricultural Sciences**, described how she applied knowledge and skills learned through her studies to the nurturing of her garden plants at home. She said, “However, I cannot say at the moment that I am pleased with the results. It’s too soon,” indicating that she checked her progress in the task [MONITORING: CHECKING PROGRESS]. She noted the relevance of monitoring in stating, “It makes me want to keep on working. I realize the advantages of gathering data for another task.”

Jintana from **Communication Arts** referred to the relevance of the Monitoring process:

> From the monitoring, I learn my faults and try to revise them later. I always monitor what I do. It improves the quality of my work and decreases my mistakes.

4.6.3 Strategies of the Problem-solving Process

Informants in both fields provided some evidence of an association between their use of the *Problem-solving* process and perceptions of its relevance. Some examples are presented in the following paragraphs.

Pornsak, a student in **Agricultural Sciences,** described tasks such as preparing the breeding ponds, producing bio-fertilizers and testing soils, when working on his fish-breeding project. He said that he had to overcome obstacles, such as fish that with excess chemical residues, [PROBLEM-SOLVING: SOLVING IT ALONE] by looking for causes, i.e., soils, water, food [PROBLEM-SOLVING: LOGIC REASONING]. Otherwise, he would look for alternatives such as the schedule and number of hormone injections [PROBLEM-SOLVING: TRYING ALTERNATIVES]. If he failed, he tried again [PROBLEM-SOLVING: EFFORT DIRECTED]. He stressed the relevance of this process by saying, "I think that working on problems, whether successfully or not, is very useful."

A **Communication Arts** student, Sumana, recalled that while producing a commercial advertisement she noticed some mistakes, such as mispronounced words, inappropriate turn taking, or soundtrack that was too loud. She solved the problems by discussing them with peers [PROBLEM-SOLVING: DISCUSSING THE PROBLEM]; [PROBLEM-SOLVING: SEEKING PEER SUPPORT] and adjusting her working method [PROBLEM-SOLVING: ADJUSTING METHODS/TECHNIQUES]. She thought that it was beneficial to use these peer activities as they made it easier for her to overcome a problem.

4.6.4 Strategies of the Evaluating Process

The students' use of the *Evaluating* process that appeared to relate to their recognition of relevance was also evident in the two disciplines.

Suebsak, a student in **Agricultural Sciences,** said that evaluation was important because it made him recognize how his own working was progressing and that accessing various resources helped save much time and greatly money and enhanced progress. He explained:

> The content I study in a library or from other resources relates to my daily life [EVALUATING: ASSESSING INFORMATION/KNOWLEDGE]. I study additional information and apply it to my future work [EVALUATING: OTHER AREA APPLICABILITY]. I mostly use this tactic in learning the major subject content [EVALUATING: WITHIN SUBJECT APPLICABILITY]. Anyway, I sometimes use it in studying other subjects [EVALUATING: OTHER AREA APPLICABILITY]. I rarely use it in learning English [EVALUATING: ASSESSING STRATEGY USE].

More evidence of this relationship was provided by a student in **Communication Arts**, Juree, notes the importance of library work:

> If we don't know how to manage ideas and information which are in different resources, we can go nowhere. We feel confused. Developing these skills saves us time in planning. Besides, we can more easily do an assignment [EVALUATING/PERCEIVED RELEVANCE-READING: ASSESSING STRATEGY USE]. The strategy is applied to different tasks such as in group work [EVALUATING/USE-READING: ASSESSING STRATEGY USE]; [EVALUATING/USE: WITHIN SUBJECT APPLICABILITY]. To think logically prevents us from delaying others.

Juree also evaluated strategy use after completing a task by reviewing the solved problem [EVALUATING/USE: ASSESSING STRATEGY USE]. She stressed that this helped her know how to keep on working [EVALUATING/PERCEIVED RELEVANCE: ASSESSING STRATEGY USE].

The above relationships between perceptions of relevance and use of metacognitive processes suggest a link between what students think is important and what they choose to do, or between what they have done and the importance of that activity to them thereafter. As a result these relationships were tested further in the quantitative component of this research. These findings are presented in chapter 5.

4.7 RELEVANCE TO INSTRUCTORS AND INCORPORATION IN TEACHING

Also evident in the interview data was a relationship between what metacognitive processes instructors believed to be relevant or salient and what they included in their lectures. This occurred for all four processes. Examples of this evidence are presented in this section.

4.7.1 Strategies of the Planning Process

Teerasak, one of the instructors in **Agricultural Sciences**, referred to the relevance of *Planning strategies,* such as *pre-reviewing concepts,* and that few of his students did carry out pre-reviewing, but the ones who did, learnt faster and did better [PLANNING: PRE-REVIEWING CONCEPTS]. In his lectures, therefore, he advised his students to review related materials before they did a task. He also noticed that many of the students rarely did any self-study and instead relied heavily on instructors, so he emphasised self-study in his teaching [PLANNING: CONCENTRATION IN CLASS]; [SPENDING EXTRA TIME TO STUDY/PRACTICE].

Another example was evident in Rinnaree's transcript Rinnaree reported advising students to prepare for work by telling them where to get information [PLANNING: MANAGING RESOURCES] and what to look for [PLANNING: GOAL SETTING]. For example, she told them to check which meat products were in demand and to note the differences between each product and the possible causes for differences between prices in each local market [PLANNING: MANAGING RESOURCES]. She also included the *managing resources strategy* into her teaching by encouraging students to suggest appropriate resources [PLANNING: MANAGING RESOURCES]. She noted that this inspired them to want to learn.

Dara, an instructor in **Communication Arts,** reported teaching her students to consider related concepts before carrying out a task [PLANNING: PRE-REVIEWING CONCEPTS]. Dara noted the relevance of this in that it forced students to learn what they want, which improved the quality of their work. It helped them to plan and they were successful as a result. This in turn boosted their self-esteem.

4.7.2 Strategies of the Monitoring Process

Only limited evidence was found in the interview data regarding the link between the incorporation of *Monitoring* process in teaching and its relevance to instructors.

Teerasak, an **Agricultural Science** instructor, noticed that his students needed prompting to check their own learning [MONITORING: CHECKING PROGRESS]. Since he felt that self-monitoring of progress was very important for successful learning, he used scores to reward his students for using this strategy.

Wanwipa, a **Communication Arts** instructor, said monitoring was very important in Communication Arts. Recognising that this helped learners improve, she always reminded learners to check and remedy any mistakes they made after class practice [MONITORING: DETECTING A PROBLEM] and to do it repeatedly [PROBLEM-SOLVING: MAKING REVISION]. She also made sure they checked whether they could perform better [MONITORING: CHECKING PROGRESS]. Wanwipa noted that, initially, students were too self-conscious to perform a task in front of her, but by encouraging them to practise by themselves and to monitor their own progress; they could eventually overcome their shyness. Along the way they also learned to recognise their own flaws, identify what was needed to improve [PROBLEM-SOLVING: SEEKING WAYS FOR IMPROVEMENT] and take action to correct their flaws. [PROBLEM-SOLVING: MAKING REVISION].

4.7.3 Strategies of the Problem-solving Process

Wuttipong, an **Agricultural Science** instructor, reported including some *Problem-solving strategies* in his teaching, such as giving his students guidance in order to deal with a problem they faced [PROBLEM SOLVING: CONSULTING THE INSTRUCTOR]. Elsewhere in the interview, he mentioned the importance of dealing with a problem and that "working with problems encourages learners' interest. As a result they are motivated to concentrate on their lessons."

Although he mentioned the relevance of the *Problem-solving* process repeatedly throughout the interview, Sihanart, a **Communication Arts** instructor, only reported including a few of the strategies in his teaching. In his view, stressing strategies that included *gathering information; accessing various resources* such as from different kinds of documents or people in different roles, i.e., experts, instructors, or staff; *linking with prior knowledge* and *working it out in group/solving it alone* was the best way for students to understand the lessons or to achieve their goals. He also noted that *Problem-solving strategies* were important because they encouraged learners' confidence, increased their chances of success, and enhanced the effectiveness of their work.

4.7.4 Strategies of the Evaluating Process

The incorporation of strategies of the *Evaluating* process in teaching was evident in both disciplines.

Wuttipong, an **Agricultural Science** instructor, regularly assessed his students' theoretical knowledge and practice, i.e., the outcomes of their work, their interest, and their working process [EVALUATING: ASSESSING LEARNING/WORK] in order to guide them to adjust themselves. He stressed the importance of doing assessment by which students were informed about their weaknesses and able to improve their learning. He noted, "…otherwise, the students don't take the trouble to improve their study."

Compared to her colleague, Rinnaree reported more explicit incorporation of evaluating strategies in her teaching. For example, she said she encouraged students to assess the benefits of doing a project [EVALUATING: ASSESSING LEARNING /WORK] in order to inspire them to learn more. She went on to explain how she trained her students to apply the *assessing learning/work* and *distinguishing appropriateness from inappropriateness* strategies (see section 4.5.4) and noted that students learned things beyond what the textbook could provide.

Suwaluck, in **Communication Arts**, believed that the *Evaluating* process helped make learners more accurate with their information. She therefore made it clear to her students that information from different resources must be weighed, considered, criticized [EVALUATING: ASSESSING KNOWLEDGE/INFORMATION] and then applied appropriately in practice [EVALUATING: APPLYING KNOWLEDGE TO PRACTICE]. She stressed that through using resources her students experienced thinking critically and planning. She further noted, "This eventually enhances their success".

Believing that the strategies of this process were useful for her students in carrying learning tasks and for their future careers, Wanwipa included activities that provided opportunities to apply the knowledge they learned to practice [EVALUATING: APPLYING LEARNING TO PRACTICE]. She reported that before they handed in their tasks or projects such as advertisement spots, scripts, programme broadcasts, she gave direct guidance that encouraged students to assess the advantages of their own work and to examine other's work [EVALUATING: ASSESSING WORK].

4.8 INCORPORATION IN TEACHING BY INSTRUCTORS AND USE BY STUDENTS

In numerous cases, the strategies used by students were also reported as incorporated into teaching by instructors that suggest an important link between strategy teachings, whether explicit or implicit, and the development of autonomous learning.

4.8.1 Strategies of the Planning Process

There was some evidence in the two disciplines showing similarity between the *Planning* process as incorporated into teaching by instructors and in resultant learning behaviours of the students.

Rinnaree, an **Agricultural Science** instructor, reported implicitly including in teaching how to set goals [PLANNING: GOAL SETTING] and how to manage resources before doing a task [PLANNING: MANAGING RESOURCES] (see section 4.5.1). Pornsak, one of her students who planned a fishery project revealed what he needed to collect information for the project [PLANNING: GOAL SETTING] and where to get that information, i.e., from experts or documents [PLANNING: MANAGING RESOURCES]. Chaiyasith, another student in Rinnaree's class planned to force a mango tree to bear fruit out of season and reported considering where to get cheaper or free chemical solutions for his project [PLANNING: MANAGING RESOURCES] (see section 4.8.1).

Dara, an instructor in **Communication Arts**, was explicit about guiding her students to set goals [PLANNING: GOAL SETTING] and make timeframes for their projects [PLANNING: MAKING A TIMEFRAME]; [PLANNING: MAKING A PLAN] (see section 4.5.1). Her colleagues, Spunna and Sihanart, reported including strategies on ways to prepare for work [PLANNING: MAKING A PLAN]. Some of their students, e.g., Rungmanee, Sumana and Nattawut, revealed that they set goals when doing a practical task by learning what they could from lectures and when producing a TV/radio programme [PLANNING: GOAL SETTING]. Juree reported that she prioritized her work [PLANNING: WORK ORDERING]; [PLANNING: MAKING A PLAN], while Rattana made a plan for her study [PLANNING: MAKING A PLAN] and Lukhana said that she prepared ahead for her next lesson by doing the required reading [PLANNING: PRE-READING].

4.8.2 Strategies of the Monitoring Process

It was evident in the two disciplines that the inclusion of the *Monitoring* process in teaching by instructors was reflected in the strategies used by students.

Sarayuth, Teerasak, Manee and Wuttinpong, instructors in **Agricultural Sciences**, reported modelling the *Monitoring* process by checking learners' progress and giving them feedback [MONITORING: CHECKING PROGRESS]. Wuttipong gave further detail in saying that through this strategy his learners had opportunities to learn their weaknesses [MONITORING: DETECTING OBSTACLE/ WEAKNESS]. Most students, i.e., Nuntana, Rujee, Pornsak, Samapol, Sutus and Chaiyasith, reported monitoring either their learning in general or the project they were carrying out, and in doing so, detecting their flaws.

Dara, Suwaluck, Wanwipa and Spunna, instructors in **Communication Arts** reported embedding the checking of progress into their teaching [MONITORING: CHECKING PROGRESS]. Dara also modelled the strategy of distinguishing appropriateness from inappropriateness by pointing out good activities or appropriate behaviours [MONITORING: DISTINGUISHING APPROPRIATENESS FROM INAPPROPRIATENESS]. Some students such as, Jintana, Yanee, Rattana and Lukhana also revealed their use of the *checking progress* strategy when learning or doing a project, i.e., producing advertisement spots or preparing news to broadcast. Yanee, Rattana and Juree used the *distinguishing appropriateness from inappropriateness* strategy. For example, when they studied TV/radio programmes they concentrated on how the professionals coped with the task and picked up appropriate tactics for future use [MONITORING: DISTINGUISHING APPROPRIATENESS FROM INAPPROPRIATENESS].

Wanwipa also claimed that she encouraged learners to work out their own mistakes [MONITORING: DETECTING PROBLEM/WEAKNESS] and guided them to find out their own learning styles [MONITORING: SELF-EXAMINATION]. These strategies were also used by Juree, Sumana and Lukhana, who revealed that they used *self-examination* and *detecting problem/weakness* strategies in learning and/or performing a task. Sumana, for example, said:

> I try to learn my weaknesses and I know that I do some pronunciation mistakes [MONITORING: SELF-EXAMINATION]; [MONITORING: DETECTING PROBLEM /WEAKNESS].

4.8.3 Strategies of the Problem-solving Process

The incorporation of the *Problem-solving* process by instructors that matched the students' use of this process was also evident in both disciplines.

Teerasak, an instructor in **Agricultural Sciences**, reported embedding several *Problem-solving strategies* in his teaching, i.e., *consulting the instructor, choosing suitable solutions* and *changing to alternatives* (as mentioned in section 4.6.3). Marut, Nuntana and Rujee, his students, reported consulting their instructors [PROBLEM-SOLVING: CONSULTING THE

INSTRUCTOR]. Pornsak noted that, in studying techniques for his fishery project, he consulted the instructor, other experts, or looked for information in a range of documents [PROBLEM-SOLVING: ACCESSING RESOURCES]. He chose those solutions that had been empirically studied [PROBLEM-SOLVING: LOOKING FOR SOLUTIONS]. In addition, Pornsak and others reported trying other techniques, or adjusting their methods or steps, if they failed to solve a problem [PROBLEM-SOLVING: TRYING ALTERNATIVES].

Dara, Sihanart, Suwaluck and Spunna, instructors in **Communication Arts**, said they guided their students to find solutions and gave them one-on-one consultations if needed [PROBLEM-SOLVING: CONSULTING THE INSTRUCTOR]. Sihanart and Spunna also included the *trying alternatives* and *solving it alone* strategies. Some students in the field said they were also to overcome a problem by themselves using one or more of these strategies. For example, Jintana reported that she overcomes the difficulties she encounters in listening to lectures and in carrying out practical tasks by:

> …asking friends for clarification and exchanging ideas with friends [PROBLEM-SOLVING: SEEKING PEER SUPPORT]; [PROBLEM-SOLVING: ASKING FOR CLARIFICATION]. If I dare not ask the instructor in class I note the questions and ask him/her after the class [PROBLEM-SOLVING: CONSULTING THE INSTRUCTOR]. …I learn to find out other suitable solutions by myself [PROBLEM-SOLVING: SOLVING IT ALONE]; [PROBLEM-SOLVING: TRYING ALTERNATIVES]. When I face a problem I study books, looking for helpful hints [PROBLEM-SOLVING: EXTRA READING].

4.8.4 Strategies of the Evaluating Process

The *Evaluating* process when incorporated in teaching also matched what the students did.

Rinnaree, an instructor in **Agricultural Sciences**, reported training her students to analyse and evaluate their projects [EVALUATING: ASSESSING LEARNING/WORK] (see 4.5.4). Her colleagues, Teerasak and Wuttipong, modelled evaluating achievement in learning [EVALUATING: SELF-ASSESSMENT]. Pornsak and Suebsak, students in this field, showed that they evaluated their performance and the results of their work (see section 4.6.4 for Suebsak's remark). Pornsak said:

> I evaluate my performance. I do it because I want to know the results and understand myself [EVALUATING: SELF-ASSESSMENT]; [EVALUATING: SELF-ASSESSMENT].

Suwaluck, an instructor in **Communication Arts**, encouraged her students to consider the information they had gained [EVALUATING: ASSESSING KNOWLEDGE/ INFORMATION], while Wanwipa, her colleague, guided learners to examine the work of their favourite broadcasters [EVALUATING: ASSESSING LEARNING/WORK]. Molwipa, a student in this field, said she analysed information from different materials [EVALUATING: ASSESSING KNOWLEDGE/INFORMATION]. Other students, Duanghathai, Juree, Tarinee and Nattawut, reported evaluating what they learned [EVALUATING: ASSESSING LEARNING/WORK].

SUMMARY

Results from the interview transcripts reveal that informants (students and instructors) in both Agricultural Sciences and Communication Arts perceived all four metacognitive processes as relevant to learning their MSC. In terms of use, students showed that the use of one strategy would after lead to another. While students in both fields referred to their use of many strategies within each process this appeared not to be noticed by their instructors. This is particularly the case with the *Monitoring* process, in which no instructors noticed their students' using the strategy. Instructors in the two disciplines reported that they modelled and made explicit the use of strategies. However, it seems that, in most cases, instructors only modelled a strategy without further discussion on its relevance and when and how to use it. Students seem not to use strategies that were modelled in their lectures. For instance, instructors in the Agricultural Sciences reported that their students did not try to find out solutions by themselves and that the students knew that in the end their instructors would tell them the results or would help them overcome any obstacles. Similarly, Communication Arts instructors claimed include *Planning strategies* such as goal setting, making a plan but no evidence of using the strategies in students' interview. This suggests that simply including is not an adequate teaching learning strategies. These students may require something less implicit. This also indicates that instructors might have some influence on their students' choice of metacognitive strategies. There was other evidence indicating that the students tended to use the strategies that they saw as relevant. The suggestion of a relationship between perceptions of relevance and use of strategy provides support for the quantitative analysis that is presented in the following chapters. Some relationships however are difficult to determine, for example, that between instructors' perceptions and their inclusion in teaching. This is because we would expect that everything included in lectures is done so because it is relevant. It is also problematic to investigate the relationship between instructors' perceptions of relevance and students' use of strategies because of the method of delivery, i.e., the lecture and because students will apply strategies in their own time and not when observed by lecturers.

The following chapters therefore as expected by the preliminary evidence provided in the interviews present the results of the quantitative analysis of perceptions of relevance and use of the four metacognitive processes. Specifically the next chapter presents the metacognitive strategies in learning the MSC from the survey questionnaires.

5. METACOGNITIVE STRATEGIES IN LEARNING MAJOR SUBJECT CONTENT

OVERVIEW OF THE CHAPTER

This chapter is the first of three chapters that present the results of the analysis of the questionnaire data. It addresses the perceived relevance and use of metacognitive strategies by instructors and students in the context of teaching and learning the major subject content (MSC).

5.1 ELICITATION OF INFORMATION THROUGH QUESTIONNAIRES

Instructor and student informants from both domains, Agricultural Sciences and Communication Arts, were asked to complete questionnaires directly after providing their first self-reports. Separate questionnaires were provided for the instructors and for the students. The questionnaires were designed to determine and compare the perceived relevance of metacognitive strategies, their use and their incorporation in teaching, as in the following questions:

1. Which learning strategies are students aware of in learning the subject matter content? Which strategies do they perceive as relevant and does this affect their use of strategies? Do these strategies vary across disciplines?

2. Do instructors in the given disciplines perceive certain metacognitive strategies as relevant to learning independently in the disciplines? If so, how do these perceptions affect their teaching of these strategies?

3. Which metacognitive strategies, if any, do students transfer from learning the subject discipline to learning English? Which strategies do they need to be trained in, in order to be able to learn English independently?

The **instructors' questionnaire** focused on the relevance of four metacognitive processes and how these are incorporated into their teaching. The metacognitive processes, as proposed by Chamot, Barnhardt, El-Dinary, & Robbins (1999) and including *Planning, Monitoring, Problem-solving* and *Evaluating,* were each comprised of ten strategies. There was also space for other strategies that the informants might have liked to add. The learning activities which the informants were asked to consider emphasised listening to lectures and reading materials. The questionnaire items for each process consisted of ten statements relating to the integral use of metacognitive strategy in listening to lectures and reading. Respondents were requested to rate each strategy under two sections: Section A was concerned with discerning the relevance of the strategy to the major subject content (MSC) and section B involved the incorporation of the strategies in teaching by instructors. The rating scale for the perceived relevance of a strategy ranged from 1 (strongly disagree) to 5 (strongly agree). The teaching inclusion scale covered 1 (never include in teaching), 2 (rarely include in teaching), 3 (sometimes implicitly include in teaching), 4 (sometimes explicitly include in teaching) and 5 (always explicitly include in teaching). The details are presented in Appendix 3.6.

The **students' questionnaire** included the same metacognitive processes and strategies and space for other strategies to be added. The learning activities involved listening to lectures or listening comprehension[5] and reading materials relating to the major subject content (MSC) and English (ENG). For section A, students rated their perception of the relevance of the strategies both to major subject content and to English. The scales ranged from 1 (strongly agree) to 5 (strongly disagree). Under section B, the respondents were asked to specify to what extent they actually used each strategy in learning the major subject content and in learning English. The scales ranged from 1 (never use it at all) to 5 (always use it). See details in Appendix 3.7.

5.2 QUESTIONNAIRE DATA ANALYSIS

Figure 5.1 provides a diagrammatic summary of the analyses and results presented in Chapters 5, 6 and 7. Overall percentages, median scores and ranges were calculated for the four metacognitive processes by aggregating the results for the ten relevant strategies. For each individual strategy, percentage responses and median scores were calculated for the Agricultural Science and Communication Arts informants. Observed differences *between* the responses of the Agricultural Science and Communication Arts informants were assessed for significance using the *Mann-Whitney U test*[6]. Since these are planned comparisons (rather than unplanned), the alpha level for each test (Ag.Sci vs Comm.Arts) remains at 0.05.

Within each subject discipline, differences in the ratings of the four metacognitive processes were assessed using the *Friedman test*[7]. If a significant effect of 'type of

[5] The listening tasks in the L1 and in English are different in this study. While listening tasks in L1 or in learning major subject content mainly involve listening to lectures which call for learners to cope with the content, most listening tasks in English aim at listening comprehension in which ability to understand English language is a primary goal. Therefore, the former is called 'learning from lectures', the latter 'listening comprehension'.

[6] The Mann Whitney U-test is the non-parametric equivalent of the independent *t*-test. It analyses the separation between the two sets of scores. The more separated the sample group scores, the less reasonable it is to conclude that chance is responsible for the separation.

[7] The Friedman test is the non-parametric equivalent of the one factor repeated measures ANOVA.

metacognitive process' was found, pair-wise comparisons were made using the *Wilcoxon Matched-Pairs Signed Ranks test*[8] in order to determine the particular metacognitive processes that differed significantly from one another. The significance level (alpha level) for the *Wilcoxon tests* was adjusted using the *Bonferroni method*[9] so as to avoid inflation of the type 1 error rate.

The associations between perceptions of relevance and use of the strategies for students and between perceptions of relevance and incorporation in teaching for instructors were examined using *Spearman's Rank Order Correlations (rho)*[10]. It was assumed that a non-zero correlation existed between perceptions of relevance and use/incorporation in teaching by the informants.

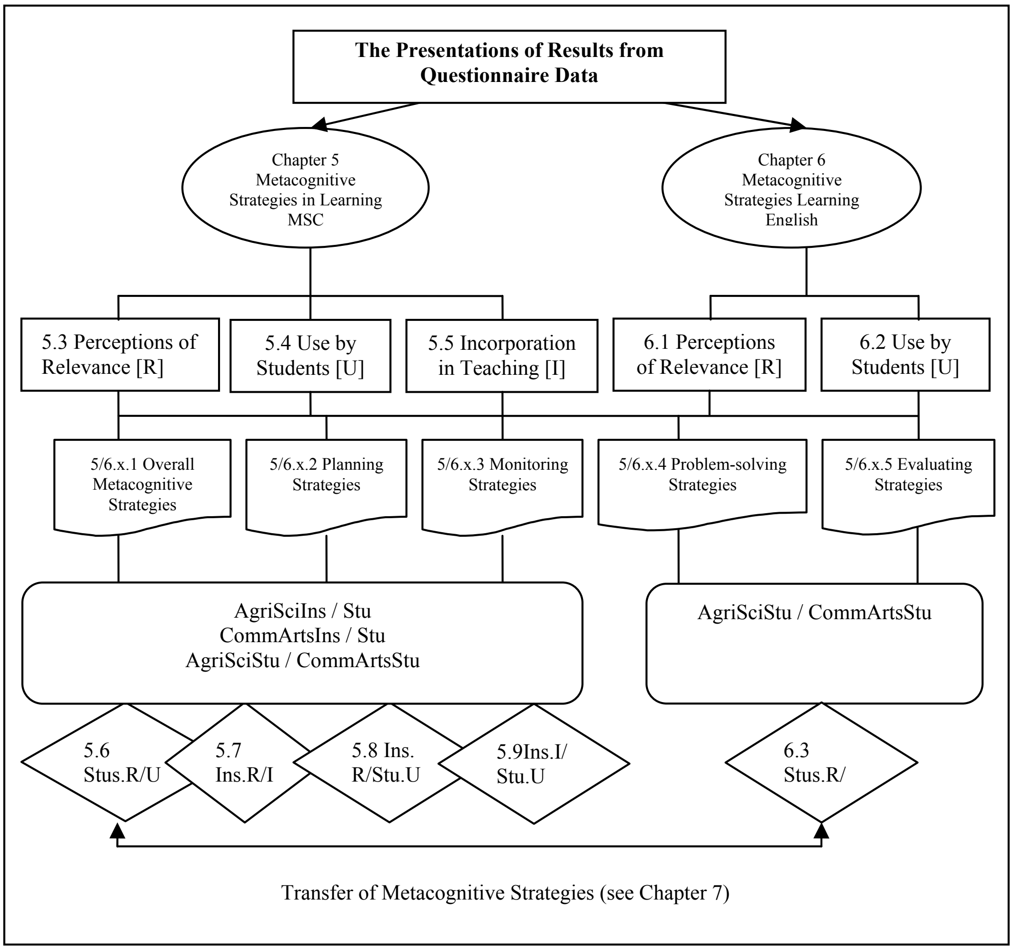

Figure 5.1 Presentation of results from the questionnaire data.

8 The *Wilcoxon Matched-Pairs Signed Ranks* test is the non-parametric equivalent of the paired samples *t*-test.

9 The adjusted alpha level equals the per family alpha level (i.e. 0.05) divided by the possible number of pairs (e.g. 0.05/6 = 0.0083)

10 Spearman's Rank Order Correlations (rho) is a non-parametric test of correlation, appropriate for ordinal data.

For each individual strategy, a comparison between the two disciplines was conducted using *Gamma*, a *PRE* (proportional reduction of error) measure of association that is used when both the variables in a cross-tabulation are ordinal. The individual strategies were rated via a *five-point Likert-style scale* and thus are considered to be ordinal variables. Although the subject discipline is a nominal rather than ordinal level variable because it is dichotomous (i.e. has only two categories – Agricultural Sciences and Communication Arts) it "can be regarded as being at any level of measurement" and treated "as being at the same level of measurement of the other variable being examined" (de Vaus, 2002, p. 262).

Within a subject group, the *Kendall's tau-b* measure of association was used in comparing the perceived relevance of a particular strategy with its use by students. Although other ordinal measures of association could have been used (e.g. *Gamma, Spearman's Rank Order Correlations (rho)* and *Kendall's tau-c*), *Kendall's tau-b* was chosen because it is particularly suitable for square tables where both variables have a relatively small number of categories, i.e. in this case, five each (de Vaus, 2002).

To examine the influence of instructors' perceived relevance of strategies on the students' use of the strategies, the per cent of instructors who *'agree'* or *'strongly agree'* which the strategy statement was compared to the per cent of students who *'often use'* or *'always use'* the strategy. Similarly, the relationship between instructors' incorporation of strategies in teaching and students' use of strategies was examined by comparing the per cent of instructors who *'sometimes explicitly include in teaching'* or *'always explicitly include in teaching'* with the per cent of students who *'often use'* or *'always use'* the strategy in learning the MSC. Because only five instructors from each discipline participated in the study, only tentative conclusions can be drawn from the comparison of students' and instructors' data. However, it is important to keep in mind that each instructor has a potentially large influence on students because of the cultural acceptance of instructors' authority in Thailand and because of the nature of institutional teaching (see the discussion in chapter 2).

5.3 PERCEPTIONS OF RELEVANCE

This section presents the findings about instructors and students' perceptions of the relevance of metacognitive strategies when learning the major subject content (MSC). Findings in relation to the overall metacognitive processes are presented first, followed by the individual strategies for each process, i.e., *Planning, Monitoring, Problem-solving* and *Evaluating*.

5.3.1 Overall Metacognitive Process

In general, **students** from both disciplines tended to rate each of the metacognitive processes as moderately relevant when learning their major subject content. As shown in Table

5.1, the median scores for Agricultural Science students ranged from 35 to 37 and from 35 to 39 for Communication Arts students, where the possible minimum score is 10 and possible maximum score is 50. The *Mann-Whitney U test* showed that there was a significant difference between the two disciplines for the *Planning* process. A greater number of informants in Communication Arts rated this process as highly relevant (see also Appendix 5.1, which provides eight frequency histograms showing the patterns of scores for each metacognitive process, by subject discipline).

Table 5.1 (STUDENTS) Perceived relevance of metacognitive processes in learning MSC

	Median		Range[1]		N		Mann-Whitney *U* Test			
							Mean Rank		Test Statistics	
	Ag.Sci	*Comm. Arts*	Ag.Sci	*Comm. Arts*	Ag.Sci	*Comm. Arts*	Ag.Sci	*Comm. Arts*	*z*	*p*
Planning	35.0	*37.5*	22	*24*	31	*42*	31.4	*41.1*	-1.93	*0.05**
Monitoring	37.0	*38.0*	18	*24*	32	*44*	38.0	*38.9*	-0.17	*0.87*
Problem-Solving	35.0	*35.0*	24	*30*	30	*40*	33.8	*36.8*	-0.60	*0.55*
Evaluating	36.0	*39.0*	32	*24*	34	*41*	33.3	*41.9*	-1.70	*0.09*

1 Maximum range = 40
* Significant at or beyond the 0.05 level.

As seen in Table 5.1, the perceived relevance of the different processes was ranked differently for each group of students. To examine the pattern of ratings within each subject discipline, the *Friedman test*, the non-parametric equivalent of the one-way within subject (or repeated measures) analysis of variance, was used. The *Friedman test* showed there was a significant difference within the pattern of ratings for both disciplines (i.e. Ag.Sci: $\chi^2 = 9.895$, df = 3, p = 0.02; Comm.Arts: χ^2.= 10.290, df = 3, p = 0.02). As the *Friedman test* was significant at the 0.05 level, indicating that at least one pair of metacognitive processes differed significantly[11], pairwise comparisons were carried out using the *Wilcoxon Matched-Pairs Signed Ranks Test*[12].

Agricultural Science students rated *Monitoring* the highest in terms of relevance, followed by *Evaluating, Problem-solving* and *Planning.* The *Friedman test* showed that there

[11] Although some of the results may be statistically significant, they are not necessarily of practical importance. For example, the median scores for the two disciplines were all in the 30s.
[12] To avoid inflation of the Type 1 error rate when conducting these unplanned comparisons, the Bonferroni method was used to adjust the alpha level for the individual *Wilcoxon Matched-Pairs Signed Ranks* tests. That is, the *per family* (or 'experiment-wise') error rate ($\alpha = 0.05$) was divided by the total number of pairwise comparisons: $0.05 \div 6 = 0.008$. Hence, to be statistically significant, the *p* value for the pairwise comparison (*Wilcoxon Matched-Pairs Signed Ranks*) needed to be ≤ 0.008.

were significant differences within this pattern of ratings ($\chi^2 = 12.560$, df = 3, $p < 0.01$). Further analysis confirmed that the difference was significant between *Problem-solving* and *Monitoring*. The full range of *Wilcoxon* results is provided in Appendix 5.2.

The **Communication Arts students** rated the relevance of the metacognitive strategies a little differently from the Agricultural Science students. They saw *Evaluating* as the most relevant of the metacognitive processes, followed by *Monitoring, Planning* and *Problem-solving*. The Communication Arts students' ratings were found to differ significantly, but the pairwise comparisons showed that the significant differences only applied to *Problem-solving* vs *Evaluating* (see Appendix 5.2).

Overall, **instructors** in Agricultural Sciences rated the relevance of each metacognitive process somewhat higher than their counterparts in Communication Arts. As shown in Table 5.2 below, the median scores for Agricultural Science instructors ranged from 33 to 40 as compared to 31 to 36 for Communication Arts instructors. However, the *Mann-Whitney U test* results for the comparisons between subject disciplines were not significant. This is not surprising, since, with such small group sizes (4 and 5), the sample scores would need to be highly separated to achieve statistical significance.

Table 5.2 (INSTRUCTORS) Perceived relevance of metacognitive processes in learning MSC

	Median		Range[1]		N	
	Ag.Sci	***Comm. Arts***	**Ag.Sci**	***Comm. Arts***	**Ag.Sci**	***Comm. Arts***
Planning	33.0	*31.0*	12	*16*	4	*5*
Monitoring	36.0	*33.0*	9	*17*	5	*5*
Problem-Solving	40.0	*33.0*	9	*13*	5	*5*
Evaluating	35.5	*36.0*	7	*15*	4	*5*

1 Maximum range = 40

The pattern of ratings was also a little different for each discipline, with the **Agricultural Science** instructors rating *Problem-solving* and *Evaluating* first and second highest of the four metacognitive processes respectively, compared to *Evaluating* and *Monitoring* for the **Communication Arts** instructors. (See the patterns of scores for each metacognitive process by subject discipline in the eight frequency histograms provided in the Appendix 5.3.)

The following sections present the findings of each individual metacognitive process: *Planning, Monitoring, Problem-solving, Evaluating*. In each section, agreement between the students in each discipline regarding learning the MSC is presented. Next the students' perceptions of relevance is compared with those of their instructors in the respective disciplines.

5.3.2 Strategies of the Planning Process

The findings on *Planning strategies* in learning the MSC are presented in this section. In Table 5.3, row percentages and *Gamma*[13] test results of comparisons between Agricultural Science and Communication Arts students are provided.

Table 5.3 (STUDENTS) Perceived relevance of *planning* strategies in learning MSC: row percentages

Planning Strategies		1 Strongly Disagree %	2 Disagree %	3 Neutral %	4 Agree %	5 Strongly Agree %	Measure of Association Gamma[1]	*p*
1. Goal setting	**Ag.Sci**	-	9	32	32	27	-0.11	*0.56*
	Comm.Arts	-	*5*	*43*	*34*	*18*		
2. Directing attention selectively	**Ag.Sci**	-	12	44	24	21	0.32	*0.07*
	Comm.Arts	-	*2*	*30*	*45*	*23*		
3. Linking with prior knowledge	**Ag.Sci**	-	6	42	36	15	0.12	*0.49*
	Comm.Arts	-	*14*	*23*	*43*	*20*		
4. Expecting the encountered problems	**Ag.Sci**	-	30	39	27	3	0.37	*0.02**
	Comm.Arts	*2*	*11*	*41*	*20*	*26*		
5. Intending to ignore distractions/inappro-priate thoughts	**Ag.Sci**	9	12	18	32	29	0.32	*0.06*
	Comm.Arts	-	*4*	*23*	*25*	*48*		
6. Preparing to confront obstacles	**Ag.Sci**	-	3	23	53	21	0.22	*0.25*
	Comm.Arts	-	-	*20*	*48*	*32*		
7. Predicting outcomes/ answers	**Ag.Sci**	12	26	26	24	12	0.08	*0.63*
	Comm.Arts	*4*	*23*	*43*	*16*	*14*		
8. Predicting the incoming information	**Ag.Sci**	-	33	21	33	12	0.13	*0.43*
	Comm.Arts	*7*	*14*	*33*	*23*	*23*		
9. Choosing strategies for the task	**Ag.Sci**	-	*18*	*47*	*18*	*18*	0.24	*0.17*
	Comm.Arts	-	*7*	*44*	*28*	*21*		
10. Work ordering	**Ag.Sci**	6	-	32	27	35	0.12	*0.50*
	Comm.Arts	-	*7*	*18*	*39*	*36*		

1 Negative gammas indicate that Ag.Sci students, on the whole, perceived the strategy as more relevant than the Comm.Arts students. Positive gammas indicate that the Comm.Arts students, on the whole, perceived the strategy as more relevant than the Ag.Sci students.

* Significant at or beyond the 0.05 level.

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[13] Gamma is a PRE (proportional reduction of error) measure of association that is used when both the variables in a cross-tabulation are ordinal level. For these analyses, Agri. Sci. was coded as 0 and Comm.Arts coded as 1. Hence, in interpreting the Gamma statistic, a negative coefficient indicates that the Agri. Sci. students tended to rate the strategy more highly than the Comm. Arts students. A positive coefficient indicates that the Comm.Arts students tended to rate the strategy more highly than the Agri.Sci students. To be considered statistically significant, the p value of the Gamma coefficient must be $\leq$ 0.05.

Generally, the students in **the two disciplines** tended to rate the relevance of *Planning strategies* similarly. However, a significant difference was found for their perceptions of relevance of strategy no. 4 '*expecting the encountered problem':* the Communication Arts rated it as more relevant than did the students in Agricultural Sciences. This could be because Agricultural Science tasks are generally more instructive, while Communication Arts tasks are more likely to require students to accomplish projects without close guidance from an instructor.

Differences in the ratings of individual strategies **within each discipline** were not tested because of the large number of pairwise comparisons that would be required (i.e. 45) and the problem of maintaining an appropriate Type 1 error rate. Moreover, due to the small number of instructor informants, it would have been problematic to test for significant differences between instructors and students.

Table 5.4 presents the 'percentage agreement' figures for instructors and students. That is, the per cent of informants who said they 'agree' or 'strongly agree' that a strategy is relevant in learning the MSC. Although students' percentages can be derived from Table 5.3, they have been repeated here to enable easy comparison with the instructors' percentages. Some differences between students and instructors were found within each discipline. For example, in Agricultural Sciences, many students (74 per cent) expressed agreement (including *agree* and *strongly agree*) on the relevance of strategy no. 6 '*preparing to confront obstacles'* while only a few instructors did. Similarly, while strategy no. 7 *'predicting outcomes'* received a low agreement rating from the students (36 per cent), not one of the instructors thought that it was relevant. Interestingly, more Agricultural Science instructors (60 per cent) saw the relevance of strategy no. 9 '*choosing strategies for the task'*, but only 30 per cent students did.

Table 5.4 Perceived relevance of *planning* strategies in learning MSC: per cent agreement [1]

Planning Strategies	**Per cent Agreement[1] (%)**			
	Ag. Sci.[2]		**Comm. Arts[3]**	
	Instructors	***Students***	**Instructors**	***Students***
1. Goal setting	40	*59*	40	*52*
2. Directing attention selectively	20	*45*	60	*68*
3. Linking with prior knowledge	40	*51*	60	*63*
4. Expecting the encountered problem	40	*30*	60	*46*
5. Intending to ignore distractions/in-	60	*61*	40	*73*
6. Preparing to confront obstacles	40	*74*	40	*80*
7. Predicting outcomes/answers	0	*36*	40	*30*
8. Prediction the incoming	20	*45*	0	*46*
9. Choosing strategies for the task	60	*36*	40	*49*
10. Work ordering	60	*62*	60	*75*

1 Per cent of respondents who 'agreed' or 'strongly agreed' that the strategy was relevant in learning MSC
2 Ag.Sci: Instructors = 5; Students = 34
3 Comm.Arts: Instructors = 5; Students = 44

In **Communication Arts,** the students were more likely than the instructors to acknowledge the relevance of strategies nos. 5 *'intending to ignore distractions'* and 6 *'preparing to confront obstacles'* in learning the MSC. As seen for the Agricultural Sciences, there was one strategy (no. 8 *'predicting the incoming information')* that a sizeable proportion (46 per cent) of the Communication Arts students saw as relevant, whereas none of their instructors did.

5.3.3 Strategies of the Monitoring Process

This section contains the findings on Monitoring strategies for learning the MSC. As is evident in Table 5.5 below, generally **Agricultural Science and Communication Arts** students tended to rate the relevance of *Monitoring strategies* similarly. No significant difference was found. Communication Arts students rated strategies nos. 1 *'comprehension check'* and 4 *'seeking related prior knowledge'* as slightly more relevant than students in Agricultural Sciences. However, the difference does not reach statistical significance.

Table 5.5 (STUDENTS) Perceived relevance of *monitoring* strategies in learning MSC: row percentages

Monitoring Strategies		1 Strongly Disagree %	2 Disagree %	3 Neutral %	4 Agree %	5 Strongly Agree %	Measure of Association Gamma[1]	*P*
1. Comprehension check	Ag.Sci	3	12	39	36	9	0.31	*0.06*
	Comm.Arts	-	*9*	*34*	*25*	*32*		
2. Checking progress	Ag.Sci	3	6	27	42	21	0.00	*0.99*
	Comm.Arts	-	*5*	*32*	*45*	*18*		
3. Detecting weaknesses/obstacles	Ag.Sci	3	3	18	33	42	-0.14	*0.43*
	Comm.Arts	-	*4*	*34*	*23*	*39*		
4. Seeking related prior knowledge	Ag.Sci	-	16	34	41	9	0.32	*0.06*
	Comm.Arts	-	*9*	*25*	*41*	*25*		
5. Checking the retrieval of expected information	Ag.Sci	3	9	24	33	30	-0.05	*0.77*
	Comm.Arts	-	*11*	*32*	*27*	*30*		
6. Checking the attention	Ag.Sci	-	6	12	36	46	-0.18	*0.32*
	Comm.Arts	-	*7*	*25*	*29*	*39*		
7. Checking appropriateness of the strategy used	Ag.Sci	-	3	33	39	24	-0.17	*0.33*
	Comm.Arts	-	*11*	*34*	*34*	*21*		
8. Checking importance of the information	Ag.Sci	6	3	9	49	33	-0.13	*0.45*
	Comm.Arts	*2*	*11*	*25*	*25*	*36*		
9. Checking the linkage to other subjects	Ag.Sci	3	6	24	42	24	-0.15	*0.38*
	Comm.Arts	*4*	*21*	*18*	*32*	*25*		
10. Checking correctness of the predictions	Ag.Sci	15	24	21	24	15	0.03	*0.86*
	Comm.Arts	*7*	*29*	*32*	*14*	*18*		

1 Negative gammas indicate that Ag.Sci students, on the whole, perceived the strategy as more relevant than the Comm.Arts students. Positive gammas indicate that the Comm.Arts students, on the whole, perceived the strategy as more relevant than the Ag.Sci students.

* Significant at or beyond the 0.05 level.

Agricultural Science informants (instructors & students) shared some points of view on the relevance of *Monitoring strategies* (Table 5.6 below). The mean percentage was 58 for instructors and 63 for students. However, they differed in the recognition of many strategies. For instance, instructors agreed highly on the relevance of strategy no. 1, which received agreement from only 45 per cent of students. Conversely, more than half of the students agreed on the relevance of strategies nos. 2, 7, 8 and 9, although these were reported as relevant by only a few instructors. Strategies nos. 3 and 6 were seen as highly relevant for both instructors and students, while strategy no. 10 was not highly marked by either group.

Table 5.6 Perceived relevance of *monitoring* strategies in learning MSC: per cent agreement [1]

Monitoring Strategies	Per cent Agreement[1] (%) Ag. Sci.[2]		Comm. Arts[3]	
	Instructors	***Students***	**Instructors**	***Students***
1. Comprehension check	80	*45*	40	*57*
2. Checking progress	40	*63*	40	*63*
3. Detecting obstacles/weaknesses	80	*75*	40	*62*
4. Seeking related prior knowledge	40	*50*	60	*66*
5. Checking the retrieval of required information	80	*63*	60	*57*
6. Checking the attention	80	*82*	40	*68*
7. Checking appropriateness of the strategy being used	40	*63*	40	*55*
8. Checking importance of the information	60	*82*	40	*61*
9. Checking the linkage to other subjects	40	*66*	20	*57*
10. Checking the predictions/answers	40	*39*	0	*32*

1 Per cent of respondents who 'agreed' or 'strongly agreed' that the strategy was relevant in learning MSC.
2 Ag.Sci: Instructors = 5; Students = 34
3 Comm.Arts: Instructors = 5; Students = 44

As seen in Table 5.6, generally students and instructors in **Communication Arts** expressed moderate agreement on the relevance of *Monitoring strategies*. The mean percentages of the instructors and students on the agreement of relevance (including *agree* and *strongly agree)* were 38 and 58 respectively. Instructors and students were similar in noting the relevance of strategies nos. 4 and 5, but their views diverged on the relevance of other strategies. For example, more than half of the students agreed on the relevance of strategies nos. 9 and 10, but few or none of the instructors did.

5.3.4 Strategies of the Problem-solving Process

Problem-solving strategy results are presented in this section. As the between-group comparison shows (see Table 5.7 below), the students in the two disciplines differed significantly in their ratings of strategy no. 3 *'ignoring problems'*: Agricultural Science students acknowledged its relevance more than Communication Arts students. A difference also emerged in relation to *'self-encouragement'* (no. 10) where Communication Arts students gave far more credit to this strategy. Further discussion on this anomaly will be included in chapter 9.

Table 5.7 (STUDENTS) Perceived relevance of *problem-solving* strategies in learning MSC: row percentages

Problem-Solving Strategies		1 Strongly Disagree %	2 Disagree %	3 Neutral %	4 Agree %	5 Strongly Agree %	Measure of Association Gamma[1]	*p*
1. Revising the plan	**Ag.Sci**	3	15	17	53	12	0.31	*0.06*
	Comm.Arts	-	*7*	*23*	*36*	*34*		
2. Accessing various resources	**Ag.Sci**	9	21	29	18	23	0.18	*0.28*
	Comm.Arts	-	*20*	*25*	*30*	*25*		
3. Ignoring problems	**Ag.Sci**	15	27	27	18	12	-0.32	*0.05**
	Comm.Arts	*28*	*38*	*17*	*5*	*12*		
4. Asking for clarification	**Ag.Sci**	9	21	27	18	24	0.24	*0.16*
	Comm.Arts	-	*12*	*37*	*21*	*30*		
5. Linking with prior knowledge	**Ag.Sci**	-	3	26	56	15	0.00	*1.00*
	Comm.Arts	-	*4*	*27*	*50*	*18*		
6. Seeking peer support	**Ag.Sci**	-	15	39	18	27	-0.05	*0.79*
	Comm.Arts	-	*11*	*46*	*25*	*18*		
7. Trying alternatives	**Ag.Sci**	6	12	21	35	26	-0.02	*0.89*
	Comm.Arts	*2*	*5*	*33*	*41*	*19*		
8. Making new guesses	**Ag.Sci**	15	26	26	15	18	0.29	*0.07*
	Comm.Arts	*5*	*18*	*27*	*27*	*23*		
9. Logic reasoning	**Ag.Sci**	6	9	35	32	18	-0.20	*0.23*
	Comm.Arts	*4*	*23*	*34*	*25*	*14*		
10. Self-encouragement	**Ag.Sci**	-	9	15	39	36	0.54	*<0.01**
	Comm.Arts	-	*7*	*7*	*11*	*75*		

1 Negative gammas indicate that Ag.Sci students, on the whole, perceived the strategy as more relevant than the Comm.Arts students. Positive gammas indicate that the Comm.Arts students, on the whole, perceived the strategy as more relevant than the Ag.Sci students.

* Significant at or beyond the 0.05 level.

As is evident in Table 5.8 (below), **Agricultural Science** informants tended towards a moderate level of agreement on the relevance of *Problem-solving strategies.* The mean percentages were 64 among the instructors and 51 among students. Although the students and instructors in this field shared a common view on the relevance of some strategies (i.e., 1, 5, 6, 7 and 10), they differed in others. For instance, some strategies were commonly accepted as valuable among the instructors, but seen as not relevant or less relevant by the students (i.e., 2, 4, 8 and 9). Moreover, whereas 30 per cent of the students agreed on the relevance of strategy no. 3, none of the instructors did.

Table 5.8 Perceived relevance of *problem-solving* strategies in learning MSC: per cent agreement [1]

Problem-Solving Strategies	Per cent Agreement[1] (%) Ag. Sci.[2] Instructors	*Students*	Comm. Arts[3] Instructors	*Students*
1. Revising the plan	80	*65*	60	*70*
2. Accessing various resources	100	*41*	60	*55*
3. Ignoring problems	0	*30*	20	*17*
4. Asking for clarification	60	*42*	100	*51*
5. Linking with prior knowledge	60	*71*	60	*68*
6. Seeking peer support	40	*45*	40	*43*
7. Trying out alternatives	60	*61*	20	*60*
8. Making new guesses	80	*33*	20	*50*
9. Logic reasoning	80	*50*	40	*39*
10. Self-encouragement	80	*75*	60	*86*

1 Per cent of respondents who 'agreed' or 'strongly agreed' that the strategy was relevant in learning MSC
2 Ag.Sci: Instructors = 5; Students = 34
3 Comm.Arts: Instructors = 5; Students = 44

Table 5.8 reveals that the instructors and students in **Communication Arts** also tended towards moderate agreement on the relevance of *Problem-solving strategies*. The mean percentages of the instructors and the students were 48 and 52 respectively. The instructors and students did diverge somewhat on the relevance of strategies nos. 4, 7, 8 and 10. For example, whereas all instructors agreed on the relevance of strategy no. 4, only 51 per cent of students did. With strategies 7, 8 and 10, although more than half the students agreed on their relevance, fewer instructors did so. It is possible that these strategies are less likely to be relevant to the prescribed learning tasks in classroom setting, but they might have been proved to be useful for students in dealing with difficulties outside of the class. Interestingly, only one instructor rated his/her agreement on the relevance of *'trying out alternatives'* (no. 7), while four out of the five instructors reported the relevance of this strategy in the interviews. Discussion on this issue will be included in chapter 9.

5.3.5 Strategies of the Evaluating Process

This section contains results on the last of the metacognitive process, *Evaluating strategies.* As evident in Table 5.9 below, students in Communication Arts were more likely to perceive strategies 2, 4 and 7 as relevant to learning the MSC than did their counterparts in Agricultural Sciences. This might be the result of more opportunities to evaluate their own work being provided by Communication Arts instructors and the prevalence of less instructive tasks in the discipline generally.

Table 5.9 (STUDENTS) Perceived relevance of *evaluating* strategies in learning MSC: row percentages

Evaluating Strategies		1 Strongly Disagree %	2 Disagree %	3 Neutral %	4 Agree %	5 Strongly Agree %	Measure of Association Gamma[1]	*p*
1. Judging that the goal has been met	**Ag.Sci**	3	12	18	38	29	0.14	*0.42*
	Comm.Arts	*4*	-	*21*	*41*	*34*		
2. Strategy suitability & effectiveness	**Ag.Sci**	6	15	29	35	15	0.43	*0.01**
	Comm.Arts	*5*	*4*	*16*	*39*	*36*		
3. Within subject applicability	**Ag.Sci**	6	18	23	38	15	0.23	*0.16*
	Comm.Arts	*2*	*7*	*32*	*29*	*29*		
4. Other areas applicability	**Ag.Sci**	-	23	6	53	18	0.35	*0.04**
	Comm.Arts	-	*2*	*23*	*34*	*41*		
5. Seeking other suitable strategy	**Ag.Sci**	12	18	26	18	26	0.25	*0.13*
	Comm.Arts	*2*	*4*	*30*	*41*	*23*		
6. Summarizing lesson	**Ag.Sci**	3	18	21	32	26	0.15	*0.39*
	Comm.Arts	*2*	*5*	*27*	*36*	*30*		
7. Judging how much learned	**Ag.Sci**	3	12	38	32	15	0.36	*0.03**
	Comm.Arts	-	*9*	*26*	*28*	*37*		
8. Assessing correctness of the predictions	**Ag.Sci**	3	23	41	15	18	0.07	*0.69*
	Comm.Arts	*2*	*23*	*32*	*32*	*11*		
9. Comparing new knowledge with known knowledge	**Ag.Sci**	-	12	21	38	29	-0.02	*0.91*
	Comm.Arts	*2*	*9*	*18*	*46*	*25*		
10. Judging worthiness of learning	**Ag.Sci**	9	3	18	38	32	0.08	*0.66*
	Comm.Arts	*2*	*9*	*21*	*27*	*41*		

1 Negative gammas indicate that Ag.Sci students, on the whole, perceived the strategy as more relevant than the Comm.Arts students. Positive gammas indicate that the Comm.Arts students, on the whole, perceived the strategy as more relevant than the Ag.Sci students.

* Significant at or beyond the 0.05 level.

As seen in Table 5.10 below, generally instructors and students in the **Agricultural Science** content area had similar views on the relevance of *Evaluating strategies*. Both tended towards a moderate recognition of their relevance (the mean percentage equals 68 among instructors and 56 among students). Both instructors and students expressed low level agreement on the relevance of strategy no. 8 *'assessing correctness of predictions'*. However, some mismatch was found in a number of other strategies where three or more instructors agreed (including *agree* and *strongly agree*) on the relevance, but lower percentages of students did (e.g., nos. 2 and 3). This was particularly the case with nos. 5, 6 and 7 where considerable difference was evident between instructors and students' opinions. Other strategies (nos. 9 and 10) tended to be seen as more relevant by students. Given the small number of instructors, however, these percentage results must be treated with caution.

Table 5.10 Perceived relevance of *evaluating* strategies in learning MSC: per cent agreement [1]

Evaluating Strategies	**Per cent Agreement (%)[1]**			
	Ag. Sci.[2]		**Comm. Arts[3]**	
	Instructors	**Students**	**Instructors**	**Students**
1. Judging that the goal has been met	80	*67*	60	*75*
2. Strategy suitability & effectiveness	80	*50*	40	*75*
3. Within subject applicability	75	*53*	40	*58*
4. Other areas applicability	60	*71*	60	*75*
5. Seeking other suitable strategy	80	*44*	60	*64*
6. Summarizing lesson	100	*58*	60	*66*
7. Judging how much learned	80	*47*	60	*65*
8. Assessing correctness of the	20	*33*	60	*43*
9. Comparing new knowledge with	40	*67*	40	*71*
10. Judging worthiness of learning	60	*70*	60	*68*

1 Per cent of respondents who 'Agreed' or 'Strongly Agreed' that the strategy was relevant in learning MSC
2 Ag.Sci: Instructors = 5; Students = 34
3 Comm.Arts: Instructors = 5; Students = 44

Table 5.10 shows that there was overall similarity in the perceived relevance of *Evaluating strategies* among instructors and students in **Communication Arts**. A moderate percentage of the informants (mean percentage equals 54 and 66, for instructors and students respectively) expressed agreement (including *agree* and *strongly agree*) on their relevance. With the exception of strategy 8 *'assessing correctness of the prediction',* the students were a little more likely than their instructors to agree that each of the *Evaluating strategies* were relevant to learning the MSC, especially strategy nos.2 *'strategy suitability & effectiveness'* and 9 *'comparing new knowledge with known knowledge'*.

5.4 USE BY STUDENTS

This section contains five sub-sections of strategies of metacognitive processes use by students. Unlike the perceived relevance, only students were requested to respond to these questions, therefore, the following sub-sections present the results from the students' responses.

As in section 5.3, the findings of the overall metacognitive processes are followed by the results for each individual process.

5.4.1 Overall Metacognitive Process

In the Table 5.11 below, medians, ranges, numbers and *Mann-Whitney U test* results of the different processes are ranked separately for strategy use for each group of students. The medians are mostly in the 30s, indicating that **students in both disciplines** reported a moderate level of use of all metacognitive processes when learning their major subject content. However, the *Mann-Whitney U test* showed that there were significant differences between the two disciplines in their use of *Planning* and *Evaluating* processes: Communication Arts students rated more frequent use of both processes (see also the eight frequency histograms showing the patterns of scores for each metacognitive process by subject discipline in Appendix 5.4).

Table 5.11 (STUDENTS) Use of metacognitive processes in learning MSC

	Median		Range[1]		N		Mann-Whitney *U* Test			
							Mean Rank		Test Statistics	
	Ag.Sci	*Comm. Arts*	Ag.Sci	*Comm. Arts*	Ag.Sci	*Comm. Arts*	Ag.Sci	*Comm. Arts*	*z*	*p*
Planning	32.0	*35.0*	21	*24*	30	*41*	28.3	41.6	-2.69	*0.01**
Monitoring	35.0	*37.0*	21	*29*	29	*42*	31.0	*39.5*	-1.70	*0.09*
Problem-Solving	34.0	*34.5*	27	*25*	30	*40*	31.9	*38.2*	-1.28	*0.20*
Evaluating	35.0	*39.0*	31	*30*	34	*42*	31.8	*44.0*	-2.40	*0.02**

1 Maximum range = 40
* Significant at or beyond the 0.05 level

Within the pattern of ratings, the *Friedman test* showed that there was a significant difference for the Communication Arts students (χ^2 = 11.193, df = 3, p = 0.011), but not for the Agricultural Science students (i.e. χ^2 = 5.705, df = 3, p = 0.127). As the *Friedman test* was significant at the 0.05 level for the Communication Arts students (indicating that at least one pair of metacognitive processes differed significantly), pairwise comparisons were carried out using the *Wilcoxon Matched-Pairs Signed Ranks Test*[14]. The measurements showed that there was significant difference only between the *Problem-solving* and *Evaluating* processes (z = -2.963, p = .0003) for the Communication Arts students (see Appendix 5.5).

The following sections (section 5.4.2-5.4.5) present the findings for the individual strategies within each of the four metacognitive processes, i.e., *Planning, Monitoring, Problem-*

[14] The Bonferroni method was used to adjust the alpha level for the individual *Wilcoxon Matched-Pairs Signed Ranks* tests. Hence, to be statistically significant, the p value for the pairwise comparison (*Wilcoxon Matched-Pairs Signed Ranks* test) needed to be ≤ 0.008.

solving, Evaluating. Each section contains a comparison of strategy use by students between the two disciplines, and the strategies used within each discipline.

5.4.2 Strategies of the Planning Process

The extent to which students in **Agricultural Sciences and Communication Arts** report using individual *Planning strategies* in learning MSC is displayed in Table 5.12 below. It is notable that all the Gamma coefficients are positive. However, only strategies nos. 2, 3, 5, 7, 8 and 9 had *Gamma* coefficients that were both sufficiently large (i.e., > 0. 3) and statistically significant (p < .05) which supports that the Communication Arts students tended to make more use of these *Planning strategies* than the Agricultural Science students.

Within the **Agricultural Sciences,** only two of the *Planning strategies*, nos. 6 *'preparing to confront obstacles'* and 10 *'work ordering'* were reported as being frequently used by at least 50 per cent of students. The least used strategy was no.7 *'predicting outcomes'* with only 22 per cent of students reporting that they often or always used it.

Table 5.12 (STUDENTS) Use of *planning* strategies in learning MSC: row percentages

Planning Strategies		1 Never Use %	2 Rarely Use %	3 Sometimes Use %	4 Often Use %	5 Always Use %	Measure of Association Gamma[1]	*p*
1. Goal setting	Ag.Sci	-	9	56	29	6	0.04	*0.83*
	Comm.Arts	-	*4*	*64*	*18*	*14*		
2. Directing attention selectively	Ag.Sci	6	9	59	14	12	0.38	*0.02**
	Comm.Arts	-	*9*	*35*	*40*	*16*		
3. Linking with prior knowledge	Ag.Sci	3	12	58	21	6	0.49	*<0.01**
	Comm.Arts	*2*	*5*	*32*	*50*	*11*		
4. Expecting the encountered problems	Ag.Sci	3	41	19	25	12	0.29	*0.09*
	Comm.Arts	*2*	*16*	*34*	*30*	*18*		
5. Intending to ignore distractions/inappropriate thoughts	Ag.Sci	12	12	27	27	21	0.41	*0.01**
	Comm.Arts	-	*5*	*23*	*35*	*37*		
6. Preparing to confront obstacles	Ag.Sci	3	6	33	36	21	0.12	*0.51*
	Comm.Arts	-	*2*	*32*	*45*	*21*		
7. Predicting outcomes/ answers	Ag.Sci	12	25	41	22	-	0.38	*0.01**
	Comm.Arts	7	16	34	25	18		
8. Predicting the incoming information	Ag.Sci	6	25	31	31	6	0.33	*0.04**
	Comm.Arts	*5*	*11*	*30*	*34*	*20*		
9. Choosing strategies for the task	Ag.Sci	-	18	55	21	6	0.38	*0.03**
	Comm.Arts	-	*12*	*35*	*39*	*14*		
10. Work ordering	Ag.Sci	3	12	27	24	33	0.13	*0.48*
	Comm.Arts	-	*5*	*27*	*36*	*32*		

1 Negative gammas indicate that Ag.Sci students, on the whole, used the strategy more than the Comm.Arts students. Positive gammas indicate that the Comm.Arts students, on the whole, used the strategy more than the Ag.Sci students.

* Significant at or beyond the 0.05 level

By contrast, seven of the ten *Planning strategies* were often or always used by more than 50 per cent of the **Communication Arts** students. The most frequently used strategy was no. 5 *'intending to ignore distractions'* with 72 per cent reporting they often or always used it. The least used strategy was no. 1 *'goal setting'* (32 per cent).

5.4.3 Strategies of the Monitoring Process

As is evident in Table 5.13, students in both **Agricultural Sciences and Communication Arts** tended to rate their use of Monitoring strategies similarly. For example, strategy no. 6 *'checking the attention'* was the most frequent used strategy for both groups: 65 per cent of Agricultural Sciences and 70 per cent of Communication Arts reported that they often or always used it. Strategy no. 10 *'checking correctness of the prediction',* on the other hand, was the least used strategy, with substantial proportions of both Agricultural Science (40 per cent) and Communication Arts (43 per cent) students reporting that they rarely or never used it.

Table 5.13 (STUDENTS) Use of *monitoring* strategies in learning MSC: row percentages

Monitoring Strategies		1 Never Use %	2 Rarely Use %	3 Sometimes Use %	4 Often Use %	5 Always Use %	Measure of Association Gamma[1]	p
1. Comprehension check	**Ag.Sci**	6	21	36	33	3	0.47	*<0.01**
	Comm.Arts	-	*11*	*29*	*36*	*24*		
2. Checking progress	**Ag.Sci**	3	12	30	30	24	0.12	*0.49*
	Comm.Arts	-	*7*	*29*	*42*	*22*		
3. Detecting weaknesses/obstacles	**Ag.Sci**	3	3	33	30	30	0.07	*0.71*
	Comm.Arts	-	*9*	*29*	*24*	*38*		
4. Seeking related prior knowledge	**Ag.Sci**	3	16	44	25	12	0.33	*0.05**
	Comm.Arts	-	*11*	*29*	*38*	*22*		
5. Checking the retrieval of expected information	**Ag.Sci**	3	3	39	39	16	0.02	*0.90*
	Comm.Arts	-	*11*	*34*	*32*	*23*		
6. Checking the attention	**Ag.Sci**	-	6	29	23	42	-0.01	*0.96*
	Comm.Arts	-	*7*	*23*	*34*	*36*		
7. Checking appropriateness of the strategy used	**Ag.Sci**	3	13	47	17	20	0.26	*0.14*
	Comm.Arts	-	*12*	*30*	*33*	*26*		
8. Checking importance of the information	**Ag.Sci**	7	17	23	37	17	0.33	*0.06*
	Comm.Arts	*2*	*5*	*26*	*35*	*33*		
9. Checking the linkage to other subjects	**Ag.Sci**	3	19	39	26	13	0.16	*0.35*
	Comm.Arts	*10*	*10*	*31*	*26*	*24*		
10. Checking correctness of the predictions	**Ag.Sci**	20	20	27	23	10	0.03	*0.87*
	Comm.Arts	*10*	*33*	*31*	*7*	*19*		

1 Negative gammas indicate that Ag.Sci students, on the whole, used the strategy more than the Comm.Arts students. Positive gammas indicate that the Comm.Arts students, on the whole, used the strategy more than the Ag.Sci students.

* Significant at or beyond the 0.05 levels

Significant differences were found between the student groups for strategy no. 1 *'comprehension check'* and no. 4 *'seeking related knowledge'.* In both cases, the Communication Arts students were likely to report using the strategy than their Agricultural Science counterparts.

5.4.4 Strategies of the Problem-solving Process

The results presented in this section are those of the use of *Problem-solving strategies* for MSC learning. The between-group comparison (see Table 5.14 below) shows that there were significant differences between students in **the two disciplines** in their ratings of strategies nos. 2, 3, 5 and 10. Agricultural Science students reported more frequent use of strategy no.3 *'ignoring problems'* than did the students of Communication Arts. This supports the interview data where instructors in the Agricultural Sciences reported that their students did not try to find out solutions by themselves and that the students knew that in the end their instructors would tell them the results or would help them overcome any obstacles. Communication Arts students rated more frequent use of other strategies (i.e., nos. 2 *'accessing various resources'*, 5 *'linking with prior knowledge'* and 10 *'self-encouragement'*). This, in itself, might be indicative of the different nature of learning tasks in these two disciplines. As reflected in the interviews, most tasks in Agricultural Science took place on campus where the students could easily get support from instructors or other staff. On the other hand, the students in Communication Arts were encouraged to practice in an actual work place where less support was provided, but they benefited from authentic feedback from both professionals and audiences.

For students in the **Agricultural Sciences,** the most frequently used strategies were no. 6 '*seeking peer support'* and 10 '*self-encouragement'* (54 per cent each). The least likely strategy to be used by these students was no.2 '*accessing various resources',* which is consistent with comments made by the instructors during the interviews that the students did not like solving their own problems.

In general, there was greater use of each *Problem-solving strategies* by students in **Communication Arts**. Interestingly, most of these students recorded frequent use of strategy no. 10 '*self-encouragement'* (84 per cent) whereas only 17 per cent reported frequent use of strategy no. 3 *'ignoring problem'.* The latter was also a low scoring strategy for Agricultural Science students.

Table 5.14 (STUDENTS) Use of problem-solving strategies in learning MSC: row percentages

Problem-Solving Strategies		1 Never Use %	2 Rarely Use %	3 Sometimes Use %	4 Often Use %	5 Always Use %	Measure of Association: Gamma[1]	p
1. Revising the plan	**Ag.Sci**	6	18	23	44	9	0.30	*0.06*
	Comm.Arts	-	*9*	*32*	*30*	*30*		
2. Accessing various resources	**Ag.Sci**	12	21	38	23	6	0.34	*0.03**
	Comm.Arts	-	*27*	*21*	*27*	*25*		
3. Ignoring problems	**Ag.Sci**	18	15	30	21	15	-0.36	*0.02**
	Comm.Arts	*29*	*31*	*24*	*10*	*7*		
4. Asking for clarification	**Ag.Sci**	12	12	27	27	21	0.11	*0.51*
	Comm.Arts	-	*16*	*39*	*16*	*30*		
5. Linking with prior knowledge	**Ag.Sci**	-	3	56	26	15	0.35	*0.05**
	Comm.Arts	-	*2*	*33*	*40*	*24*		
6. Seeking peer support	**Ag.Sci**	-	12	33	27	27	-0.14	*0.44*
	Comm.Arts	-	*9*	*47*	*27*	*18*		
7. Trying alternatives	**Ag.Sci**	6	23	18	32	21	0.15	*0.39*
	Comm.Arts	2	5	33	43	17		
8. Making new guesses	**Ag.Sci**	15	18	23	26	18	0.19	*0.24*
	Comm.Arts	*4*	*16*	*29*	*27*	*24*		
9. Logic reasoning	**Ag.Sci**	6	12	35	38	9	-0.16	*0.36*
	Comm.Arts	*4*	*22*	*38*	*24*	*11*		
10. Self-encouragement	**Ag.Sci**	3	9	33	24	30	0.55	*<0.01**
	Comm.Arts	-	*4*	*11*	*20*	*64*		

1 Negative gammas indicate that Ag.Sci students, on the whole, used the strategy more than the Comm.Arts students. Positive gammas indicate that the Comm.Arts students, on the whole, used the strategy more than the Ag.Sci students.

* Significant at or beyond the 0.05 level

5.4.5 Strategies of the Evaluating Process

As is evident in Table 5.15 below, students in **the two disciplines** used *Evaluating strategies* differently. Statistical tests revealed significant differences in the use of strategies nos. 2, 3, 4 and 7. The positive *Gamma* values indicate that students in Communication Arts used the strategies more frequently than their counterparts in Agricultural Sciences. The differences also distributed to a statistical difference for the overall process (see also Table 5.11).

Table 5.15 (STUDENTS) Use of *evaluating* strategies in learning MSC: row percentages

Evaluating Strategies		1 Never Use %	2 Rarely Use %	3 Sometimes Use %	4 Often Use %	5 Always Use %	Measure of Association Gamma[1]	p
1. Judging that the goal has been met	**Ag.Sci**	3	18	24	35	21	0.29	*0.09*
	Comm.Arts	*4*	-	*22*	*44*	*29*		
2. Strategy suitability & effectiveness	**Ag.Sci**	6	12	38	35	9	0.45	*<0.01**
	Comm.Arts	*4*	*4*	*22*	*36*	*33*		
3. Within subject applicability	**Ag.Sci**	9	15	41	29	6	0.50	*<0.01**
	Comm.Arts	*2*	*2*	*36*	*31*	*29*		
4. Other areas applicability	**Ag.Sci**	-	18	24	44	15	0.39	*0.02**
	Comm.Arts	-	*2*	*22*	*44*	*31*		
5. Seeking other suitable strategy	**Ag.Sci**	12	12	32	21	24	0.31	*0.07*
	Comm.Arts	*2*	-	*31*	*44*	*22*		
6. Summarizing lesson	**Ag.Sci**	6	3	35	41	15	0.26	*0.13*
	Comm.Arts	*2*	*9*	*20*	*38*	*31*		
7. Judging how much learned	**Ag.Sci**	9	9	38	29	15	0.43	*<0.01**
	Comm.Arts	-	7	23	39	32		
8. Assessing correctness of the predictions	**Ag.Sci**	3	24	26	32	15	-0.04	*0.83*
	Comm.Arts	*4*	*16*	*38*	*33*	*9*		
9. Comparing new knowledge with known knowledge	**Ag.Sci**	-	9	32	29	29	0.05	*0.76*
	Comm.Arts	*2*	*11*	*18*	*40*	*29*		
10. Judging worthiness of learning	**Ag.Sci**	9	6	24	35	27	0.15	*0.37*
	Comm.Arts	*2*	*7*	*24*	*31*	*36*		

1 Negative gammas indicate that Ag.Sci students, on the whole, used the strategy more than the Comm.Arts students. Positive gammas indicate that the Comm.Arts students, on the whole, used the strategy more than the Ag.Sci students.

* Significant at or beyond the 0.05 level

The **Agricultural Science** students tended towards a moderate use of each strategy, of which strategy no.10 '*judging worthiness of learning*' was the most frequently used (62 per cent). The least frequently used strategy was no. 3 '*judging within subject applicability*' (35 per cent).

Generally, students in **Communication Arts** again indicated greater use of *Evaluating strategies* when learning the MSC. More than 70 per cent of the students recorded frequent use of strategies nos. 1 *'judging that the goal has been met'*, 4 *'judging other areas applicability'* and 7 *'judging how much learned'*. The least likely strategy to be used was no.8 '*assessing correctness of the predictions*'. This was also a low scoring strategy for Agricultural Science students.

5.5 INCORPORATION IN TEACHING BY INSTRUCTORS

5.5.1 Overall Metacognitive Process

Table 5.16 shows the extent to which instructors directly incorporate the metacognitive processes into their teaching. The median scores for Agricultural Science instructors ranged from 34 to 39 and from 36 to 40 for Communication Arts instructors. Agricultural Science instructors rated *Problem-solving* and *Monitoring* the first and second highest respectively of the four metacognitive processes, compared to *Planning* and *Problem-solving* which were rated the highest by Communication Arts instructors. (See Appendix 5.6 for the eight frequency histograms showing the patterns of scores for each metacognitive process, by subject discipline.) The *Mann-Whitney U test* results for the comparisons between subject disciplines were not significant[15]. This is not surprising, since, with such small group sizes (4 and 5), the sample scores would need to be highly separated to achieve statistical significance.

Table 5.16 (INSTRUCTORS) Incorporation of metacognitive processes in teaching MSC

	Median		Range[1]		N	
	Ag.Sci	***Comm. Arts***	**Ag.Sci**	***Comm. Arts***	**Ag.Sci**	***Comm. Arts***
Planning	36.5	*40.0*	8	*12*	4	*4*
Monitoring	37.0	*36.5*	10	*13*	5	*4*
Problem-Solving	39.0	*39.0*	4	*6*	5	*3*
Evaluating	34.0	*36.0*	10	*10*	4	*5*

1 Maximum range = 40

5.5.2 Strategies of the Planning Process

Instructors in the two disciplines appear to differ in their incorporation of *Planning strategies* into teaching. As seen in Table 5.17 below, Communication Arts instructors' ratings on the explicit incorporation of these strategies (including *regularly* and *always*) were generally higher than those of instructors in Agricultural Sciences. The mean percentage of explicit incorporation was 57 for Agricultural Science instructors and 78 for Communication Arts instructors. Nonetheless, although there were substantial differences in the explicit

[15] Mann Whitney U test: *Planning* (z = -1.051, p = .293, two-tailed); *Monitoring* (z = -.522, p = .602, two-tailed); *Problem-solving* (z = -.983, p = .326, two-tailed); *Evaluating* (z = -.314, p = .753, two-tailed)

incorporation of strategies nos. 1, 3 and 7 in particular, they did not yield statistical significance[16]. The small size of cohorts might affect this test.

Table 5.17 (INSTRUCTORS) Incorporation of *planning* strategies in teaching MSC: per cent explicit incorporation [1]

Planning Strategies		Per Cent Explicit Incorporation[1] (%)	
		Ag.Sci.[2]	**Comm.Arts[3]**
1.	Goal setting	40	*80*
2.	Directing attention selectively	60	*80*
3.	Linking with prior knowledge	20	*100*
4.	Expecting the encountered problem	60	*80*
5.	Intending to ignore distractions/ inappropriate thoughts	80	*75*
6.	Preparing to confront obstacles	80	*60*
7.	Predicting outcomes/answers	25	*60*
8.	Predicting the incoming information	40	*40*
9.	Choosing strategies for the task	80	*100*
10.	Work ordering	80	*100*

1 Per cent of instructors who stated they 'sometimes explicitly include' or 'always explicitly include' the strategy in teaching MSC
2 N = 5
3 N = 5

5.5.3 Strategies of the Monitoring Process

As seen in Table 5.18 below, the **instructors in these two disciplines** differed slightly in the incorporation of *Monitoring strategies* into their teaching. The ratings on explicit incorporation (including *regularly* and *always*) of Agricultural Science instructors were substantially higher in three strategies (i.e., nos. 1, 3 and 6). Communication Arts instructors reported strategies nos. 4, 7 and 8 more often. The mean percentage was 66 for Agricultural Science instructors, compared with 60 for instructors in Communication Arts. These differences did not reach statistical significance[17].

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[16] Mann Whitney U test: *Planning strategy no.1* (z = -.759, p = .448, two-tailed); *no.2* (z = -.118, p = .906, two-tailed); *no.3* (z = -.1.881, p = .060, two-tailed); *no.4* (z = -.775, p = .439, two-tailed); *no.5* (z = -.437, p = .662, two-tailed); *no.6* (z = -.236, p = .813, two-tailed); *no.7* (z = -.782, p = .434, two-tailed); *no.8* (z = -.671, p = .502, two-tailed); *no.9* (z = -.693, p = .488, two-tailed); *no.10* (z = -.120, p = .905, two-tailed).

[17] Mann Whitney U test: *Monitoring strategy no.1* (z = -1.565, p = .118, two-tailed); *no.2* (z = -.565, p = .572, two-tailed); *no.3* (z = -.339, p = .735, two-tailed); *no.4* (z = -.135, p = .893, two-tailed); *no.5* (z = -.565, p = .572, two-tailed); *no.6* (z = -.672, p = .502, two-tailed); *no.7* (z = -.454, p = .650, two-tailed); *no.8* (z = -1.063, p = .288, two-tailed); *no.9* (z = -.346, p = .729, two-tailed); *no.10* (z = -.346, p = .729, two-tailed).

Table 5.18 (INSTRUCTORS) Incorporation of *monitoring* strategies in teaching MSC: per cent explicit incorporation[1]

Monitoring Strategies		Per Cent Explicit Incorporation[1] (%)	
		Ag.Sci.[2]	Comm.Arts[3]
1.	Comprehension check	80	*40*
2.	Checking progress	60	*60*
3.	Detecting weaknesses/obstacles	80	*40*
4.	Seeking related prior knowledge	60	*75*
5.	Checking the retrieval of required information	80	*80*
6.	Checking the attention	100	*60*
7.	Checking appropriateness of the strategy being used	40	*60*
8.	Checking importance of the information	60	*80*
9.	Checking linkage to other subjects	60	*60*
10.	Checking the predictions/answers	40	*40*

1 Per cent of instructors who stated they 'sometimes explicitly include' or 'always explicitly include' the strategy in teaching MSC.
2 N = 5
3 N = 5

Agricultural Science instructors always directly taught strategy no. 6 *'checking the attention'*. The lowest explicit incorporation occurred with strategies nos.7 *'checking appropriateness of the strategy being used'* and 10 *'checking the predictions'*.

The instructors in **Communication Arts** were more likely to incorporate strategies nos. 4 and 8 into their teaching. The least likely strategies to be explicitly included in teaching were nos. 1, 3 and 10 (in Table 5.18).

5.5.4 Strategies of the Problem-solving Process

Table 5.19 (below) shows that the **instructors in the two fields** widely reported explicit incorporation (including *regularly* and *always*) of *Problem-solving strategies*. The mean percentages of ratings were 74 for Agricultural Science instructors and 53 for Communication Arts instructors. There was a mismatch between ratings on all strategies except nos. 1, 4 and 5. The relevance of these strategies might explain this anomaly. Agricultural Science problems might require students to use such strategies as *'accessing various resources' 'trying alternatives', 'making new guesses'* and *'logic reasoning'*. From the interviews, there was prominent evidence that learning the Agricultural Sciences involved application of different fields of Sciences and required students to use various strategies, including *'making new guesses'* and *'logic reasoning',* for overcoming a problem. Conversely, strategies nos. 3, 7 and

8 might be considered less important and reflected in less inclusion in teaching Communication Arts. However, with such small numbers, these divergences did not reach statistical significance[18].

Table 5.19 (INSTRUCTORS) Incorporation of *problem-solving* strategies in teaching MSC: per cent explicit incorporation [1]

Problem-Solving Strategies		Per Cent Explicit Incorporation[1] (%)	
		Ag.Sci.[2]	**Comm.Arts[3]**
1.	Revising the plan	80	*80*
2.	Accessing various resources	80	*40*
3.	Ignoring problems	40	*20*
4.	Asking for clarification	100	*100*
5.	Linking with prior knowledge	100	*80*
6.	Seeking peer support	40	*60*
7.	Trying alternatives	80	*25**
8.	Making new guesses	60	*25**
9.	Logic reasoning	80	*40*
10.	Self-encouragement	80	*60*

1 Per cent of instructors who stated they 'sometimes explicitly include' or 'always explicitly include' the strategy in teaching MSC
2 N = 5
3 N = 5
* N = 4

All instructors in **Agricultural Sciences** were concerned with *Problem-solving strategies.* At least 4 out of the 5 instructors reported explicit incorporation of seven strategies. Strategies nos. 4 *'asking for clarification'* and 5 *'linking with prior knowledge'* were most often explicitly included in teaching. On the other hand, only two instructors noted the explicit inclusion of strategy no. 3 '*ignoring problems*' and 6 '*seeking peer support*.'

Overall, **Communication Arts** instructors were more moderate in the explicit incorporation of *Problem-solving strategies* into teaching, with strategy no. 4 '*asking for clarification*' being the most recorded. Strategies nos. 3, 7 and 8 were explicitly included in teaching by only one instructor each. Such strategies as *'ignoring problems', 'making new guesses'* and *'logic reasoning'* might be considered as less relevant by these instructors and

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[18] Mann Whitney U test: *Problem-solving strategy no.1* (z = -.949, p = .343, two-tailed)*; no.2* (z = -1.424, p = .154, two-tailed)*; no.3* (z = -.133, p = .910, two-tailed)*; no.4* (z = -1.225, p = .221, two-tailed); *no.5* (z = -.516, p = .606, two-tailed); *no.6* (z = -1.021, p = .307, two-tailed); *no.7* (z = -1.610, p = .107, two-tailed); *no.8* (z = -.912, p = .362, two-tailed); *no.9* (z = -1.424, p = .154, two-tailed); *no.10* (z = -1.107, p = .268, two-tailed).

therefore less likely to be incorporated into teaching. However, the findings for strategies no. 2 *'accessing various resources'* and 7 *'trying out alternatives'* were inconsistent with those found in the interviews, in which all instructors stressed the relevance of these strategies and said they incorporated them into their teaching.

5.5.5 Strategies of the Evaluating Process

The **instructors in these two disciplines** showed substantial similarity in the way they incorporated *Evaluating strategies* into teaching (see Table 5.20 below). The mean percentages of explicit incorporation (including *regularly* and *always*) were 61 for Agricultural Sciences and 60 for Communication Arts. Comparisons using the *Mann-Whitney U test* indicated that there was a significant difference only in the inclusion of strategy no. 2 *'strategy suitability and effectiveness'*[19]. However, this difference did not translate into statistical difference for the overall process (see Footnote 11).

As Table 5.20 shows, **Agricultural Science** instructors were most likely to explicitly incorporate (including *regularly* and *always incorporate*) strategies no. 1, 2, 5 and 6. Strategies no. 3 *'within subject applicability'*, 4 *'other areas applicability'*, 8 *'assessing correctness of the predictions'* and 9 *'comparing new knowledge with known knowledge'* were the least likely to be explicitly included in teaching. Some instructors reported in the interviews that these strategies were embedded in most tasks, so they might not have seen it was necessary to point them out in their teaching.

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[19] Mann Whitney U test: *Evaluating strategy no.1* (z = -1.897, p = .058, two-tailed); *no.2* (z = -1.964, p = .050, two-tailed); *no.3* (z = -1.556, p = .120, two-tailed); *no.4* (z = -.600, p = .549, two-tailed); *no.5* (z = -.949, p = .343, two-tailed); *no.6* (z = -.386, p = .700, two-tailed); *no.7* (z = -.219, p = .827, two-tailed); *no.8* (z = -.775, p = .439, two-tailed); *no.9* (z = -.996, p = .319, two-tailed); *no.10* (z = -.354, p = .723, two-tailed).

Table 5.20 INSTRUCTORS: Incorporation of *evaluating* strategies in teaching MSC – percent explicit teaching [1]

Evaluating Strategies		Per Cent Explicit Incorporation[1] (%)	
		Ag.Sci.[2]	Comm.Arts[3]
1.	Judging that the goal has been met	100	*60*
2.	Strategy suitability & effectiveness	100	*40**
3.	Within subject applicability	25	*80*
4.	Other areas applicability	40	*60*
5.	Seeking other suitable strategy	80	*80*
6.	Summarizing lesson	80	*80*
7.	Judging how much learned	60	*60*
8.	Assessing correctness of the predictions	20	*40*
9.	Comparing new knowledge with known knowledge	40	*40*
10.	Judging worthiness of learning	60	*80*

1 Per cent of instructors who stated they 'sometimes explicitly include' or 'always explicitly include' the strategy in teaching MSC.
2 N = 5
3 N = 5
* Significance at the .05 level.

Communication Arts instructors rated the explicit incorporation of *Evaluating strategies* no. 3, 5, 6 and 10 highly. Strategies no. 2, 8 and 9 were reported as explicitly included by only two instructors each. This result might be explained by the nature of the Communication Arts learning tasks, which provide little opportunity for instructors to teach these strategies explicitly.

5.6 RELEVANCE TO STUDENTS AND USE BY STUDENTS

In comparing the perceived relevance of metacognitive processes and their actual use by students, *Spearman's Rank Order Correlations (rho)* test was used. *Spearman's Rank Order Correlations (rho)* test is an appropriate measure to use with ordinal data that has a large number of categories. To compare the perceived relevance of a particular strategy with its use by students, *the Kendall's tau-b* measure of association was used. Although other ordinal measures of association could have been used (e.g. *Gamma, Spearman's Rank Order Correlations (rho)* and *Kendall's tau-c*), *Kendall's tau-b* was chosen because it is particularly suitable for square tables where both variables have a relatively small number of categories (i.e. in this case, five each). All results were statistically significant at the 0.05 level.

5.6.1 Overall Metacognitive Process

Table 5.21 shows the results of *Spearman's Rank Order Correlations (rho)*, a non-parametric test of correlation between the perceived relevance and use of metacognitive processes by students. As one might expect, the tests showed that ratings on the use of *Metacognitive processes* by the students in the given disciplines related significantly to their ratings on their relevance. This positive relationship indicated that in general these two groups of students tended to use those processes they perceived as relevant and were less likely to use the strategies they did not see as relevant.

In terms of the strength of relationship, after de Vaus (2002, pp. 258-259), the students in **Agricultural Sciences** showed a very strong relationship between their perceptions of relevance and use of the *Evaluating* process. There was a substantial positive relationship between relevance and use.

Table 5.21 (STUDENTS) Correlation between perceived relevance and use of metacognitive processes: *Spearman's Rank Order Correlations (rho)*

	Ag. Sci		Comm. Arts	
	rho[1]	p[2]	rho[1]	p[2]
Planning	**0.56**	***<0.01****	**0.90**	***<0.01****
Monitoring	**0.64**	***<0.01****	**0.86**	***<0.01****
Problem-Solving	**0.66**	***<0.01****	**0.94**	***<0.01****
Evaluating	**0.79**	***<0.01****	**0.95**	***<0.01****

1 Spearman's rho coefficient
2 Significance - two-tailed
* Significant beyond the 0.05 level

The results for the **Communication Arts** students showed that use of the *Monitoring* process related very strongly to its perceived relevance: near perfect relationships were found between the use of each process and its perceived relevance.

5.6.2 Strategies of the Planning Process

Table 5.22 (below) shows, as expected, there is mostly a moderate (i.e., *tau-b* = 0.30 - 0.49) to substantial correlation (i.e., *tau-b* = 0.50 - 0.69) between the perceived relevance of a *Planning strategy* and its actual use by **students in these two disciplines**.

Table 5.22 (STUDENTS) Association between the perceived relevance of planning strategies and the use of planning strategies in learning MSC: Kendall's tau-b

Planning Strategies		**Ag. Sci. Students[1]**		**Comm. Arts Students[2]**	
		tau-b[3]	***p***	**tau-b[3]**	***p***
1.	Goal setting	0.30	*0.09*	0.66	*<0.01[*]*
2.	Directing attention selectively	0.48	*<0.01[*]*	0.71	*<0.01[*]*
3.	Linking with prior knowledge	0.26	*0.05[*]*	0.61	*<0.01[*]*
4.	Expecting the encountered problem	0.60	*<0.01[*]*	0.53	*<0.01[*]*
5.	Intending to ignore distractions/ inappropriate thoughts	0.71	*<0.01[*]*	0.53	*<0.01[*]*
6.	Preparing to confront obstacles	0.61	*<0.01[*]*	0.64	*<0.01[*]*
7.	Predicting outcomes/answers	0.63	*<0.01[*]*	0.64	*<0.01[*]*
8.	Predicting the incoming information	0.69	*<0.01[*]*	0.77	*<0.01[*]*
9.	Choosing strategies for the task	0.72	*<0.01[*]*	0.52	*<0.01[*]*
10.	Work ordering	0.54	*<0.01[*]*	0.54	*<0.01[*]*

1 N = 34
2 N = 44
3 Kendall's tau-b coefficient
* Significant at or beyond the 0.05 level

The students in the **Agricultural Science** content area showed a very strong relationship between their perceived relevance and the use of strategies nos. 5 and 9 (i.e., *tau-b* = 0.70 - 0.89). There was a weak association between perceived relevance and use for strategy no.1 *'goal setting'* (i.e., *tau-b* <0.30) in Agricultural Sciences. Although more than half of these students rated this strategy as highly relevant, fewer used it in learning the MSC. This might be because, as both instructors and students reported in the interviews, goals were already made explicit by the instructors and related knowledge/theory was taught as an introduction.

Communication Arts students showed a positive significant relationship between use and perceived relevance beyond the level of .01 for every *Planning strategy*. A very strong relationship was found for strategies nos. 2 and 8.

5.6.3 Strategies of the Monitoring Process

As shown on Table 5.23 below, in general for **students in both disciplines** there was a relatively strong association between their use of *Monitoring strategies* and their perceptions about relevance. However, Communication Arts students showed a strong relationship for more of the strategies than did the Agricultural Science students.

Table 5.23 (STUDENTS) Association between the perceived relevance of monitoring strategies and the use of monitoring strategies in learning MSC: Kendall's tau-b

Monitoring Strategies	Ag. Sci.[1]		Comm. Arts[2]	
	tau-b[3]	*p*	tau-b[3]	*p*
1. Comprehension check	0.51	*<0.01**	0.72	*<0.01**
2. Checking progress	0.69	*<0.01**	0.67	*<0.01**
3. Detecting weaknesses/obstacles	0.72	*<0.01**	0.80	*<0.01**
4. Seeking related prior knowledge	0.35	*0.04**	0.62	*<0.01**
5. Checking the retrieval of required information	0.50	*<0.01**	0.72	*<0.01**
6. Checking the attention	0.78	*<0.01**	0.64	*<0.01**
7. Checking appropriateness of the strategy being used	0.62	*<0.01**	0.58	*<0.01**
8. Checking importance of the information	0.72	*<0.01**	0.73	*<0.01**
9. Checking linkage to other subjects	0.62	*<0.01**	0.76	*<0.01**
10. Checking the predictions/answers	0.73	*<0.01**	0.75	*<0.01**

1 N = 34
2 N = 44
3 Kendall's tau-b coefficient
* Significant at or beyond the 0.05 level

For students in **Agricultural Sciences,** there was a strong relationship between relevance and use for strategies nos. 3, 6, 8 and 10. There was a substantial relationship for another five strategies. Interestingly, the use of strategy no. 4 *'seeking related prior knowledge'* was the least likely to relate to perceptions of relevance. This supports some instructors' views that their students expected assistance from their instructors.

Communication Arts students' use of *Monitoring strategies* also related to their perceived relevance. A very strong relationship was found for six strategies (i.e., nos. 1, 3, 5, 8, 9 and 10). There was a particularly high relationship for strategy no. 3 *'detecting weaknesses/obstacles'* and a moderate relationship for all other strategies.

5.6.4 Strategies of the Problem-solving Process

As seen on Table 5.24 below, **the two groups of students** showed some similarities in that the use of *Problem-solving strategies* significantly related to their perceptions of relevance in a positive way. They also showed a strong relationship for most strategies, although there was a difference in the strength of the relationship, whereby Communication Arts students' use of these strategies related more highly to their perceived relevance for all except nos. 1 and 8.

Table 5.24 (STUDENTS) Association between the perceived relevance of problem-solving strategies and the use of problem-solving strategies in learning MSC: Kendall's tau-b

Problem-Solving Strategies	Ag. Sci.[1]		Comm. Arts[2]	
	tau-b[3]	*p*	tau-b[3]	*p*
1. Revising the plan	0.71	*<0.01**	0.75	*<0.01**
2. Accessing various resources	0.61	*<0.01**	0.89	*<0.01**
3. Ignoring problems	0.54	*<0.01**	0.81	*<0.01**
4. Asking for clarification	0.65	*<0.01**	0.90	*<0.01**
5. Linking with prior knowledge	0.40	*<0.01**	0.78	*<0.01**
6. Seeking peer support	0.57	*<0.01**	0.85	*<0.01**
7. Trying alternatives	0.77	*<0.01**	0.82	*<0.01**
8. Making new guesses	0.78	*<0.01**	0.78	*<0.01**
9. Logic reasoning	0.64	*<0.01**	0.89	*<0.01**
10. Self-encouragement	0.66	*<0.01**	0.80	*<0.01**

1 N = 34
2 N = 44
3 Kendall's tau-b coefficient
* Significant at or beyond the 0.05 level

There was a substantial relationship between the use of *Problem-solving strategies* and perceptions of their relevance among **Agricultural Science** students for strategies nos.1, 7 and 8. The weakest relationship was found for strategy no.5 *'linking with prior knowledge'*: although it was still statistically significant, it was recorded as highly relevant but only moderately used.

For the **Communication Arts** students, the relationship between use and relevance was strong for every strategy.

5.6.5 Strategies of the Evaluating Process

As evident in Table 5.25 below, **students in both disciplines** showed similar significant positive relationships between use and perceived relevance of every *Evaluating strategy*. As found for other processes, the relationships between perception and use were consistently beyond the level of 0.01. A mismatch was found only in the strength of the relationship for strategies nos. 3 and 9, for which the Communication Arts students showed a moderately stronger relationship.

Students in the **Agricultural Sciences** frequently used the *Evaluating strategies* they perceived as relevant. A particularly high relationship appeared in strategies nos. 2 *'strategies applicability & effectiveness'* and 5 *'seeking other suitable strategies'*.

Table 5.25 (STUDENTS) Association between the perceived relevance of evaluating strategies and the use of evaluating strategies in learning MSC: Kendall's tau-b

Evaluating Strategies	Ag. Sci.[1]		Comm. Arts[2]	
	tau-b[3]	*p*	tau-b[3]	*p*
1. Judging that the goal has been met	0.76	*<0.01*[*]	0.82	*<0.01*[*]
2. Strategy suitability & effectiveness	0.82	*<0.01*[*]	0.83	*<0.01*[*]
3. Within subject applicability	0.60	*<0.01*[*]	0.81	*<0.01*[*]
4. Other areas applicability	0.66	*<0.01*[*]	0.67	*<0.01*[*]
5. Seeking other suitable strategy	0.80	*<0.01*[*]	0.85	*<0.01*[*]
6. Summarizing lesson	0.70	*<0.01*[*]	0.85	*<0.01*[*]
7. Judging how much learned	0.71	*<0.01*[*]	0.77	*<0.01*[*]
8. Assessing correctness of the predictions	0.72	*<0.01*[*]	0.74	*<0.01*[*]
9. Comparing new knowledge with known knowledge	0.61	*<0.01*[*]	0.88	*<0.01*[*]
10. Judging worthiness of learning	0.70	*<0.01*[*]	0.85	*<0.01*[*]

1 N = 34
2 N = 44
3 Kendall's tau-b coefficient
* Significant at or beyond the 0.05 level

The **Communication Arts** students also showed significant positive relationships between the use of *Evaluating strategies* and perceptions of their relevance. Relatively high levels of relationship occurred for all strategies.

5.7 RELEVANCE TO INSTRUCTORS AND INCORPORATION IN TEACHING

In comparing the perceived relevance of the metacognitive processes and their incorporation in teaching by instructors, *Spearman's Rank Order Correlations (rho)* test was used because it is particularly suitable for ordinal data that has a large number of categories. As described earlier, *Kendall's tau-b was* used to measure the association between the perceived relevance of a particular strategy and its incorporation in teaching by instructors because it is particularly suitable for square tables where both variables have a relatively small number of categories (i.e. in this case, five each). Because there were only five instructors in each group, only the very strong correlations were found to be statistically significant. This does not mean that the less strong associations are invalid rather that they may not hold true for the population (i.e., all Agricultural Science and Communication Arts instructors).

5.7.1 Overall Metacognitive Process

Interestingly, the relationships found between perceptions of relevance and incorporation into teaching was stronger for the Agricultural Science instructors than their Communication Arts colleagues (see Table 5.26 below). This is the reverse of what we might expect given the strength of the relationships seen for the Communication Arts students (see Table 5. 21).

Table 5.26 (INSTRUCTORS) Correlation between perceived relevance and incorporation of metacognitive processes: ***Spearman's Rank Order Correlations (rho)***

	Ag. Sci		Comm. Arts	
	rho[1]	***p***[2]	**rho**[1]	***p***[2]
Planning	**0.63**	***0.37***	**0.20**	***0.80***
Monitoring	**0.72**	***0.17***	**0.20**	***0.80***
Problem-Solving	**0.53**	***0.36***	**0.50**	***0.67***
Evaluating	**1.00**	***<0.01******	**0.41**	***0.49***

1 Spearman's rho coefficient
2 Significance - two-tailed
* Significant beyond the 0.05 level

For the **Communication Arts instructors,** the association between relevance and incorporation was quite weak for *Planning* and *Monitoring* and only moderate for *Problem-solving* and *Evaluating*. For the **Agricultural Science instructors,** on the other hand, the associations were moderately strong for *Planning, Monitoring* and *Problem-solving* and very strong (perfect) for *Evaluating.* The latter result is borne out by the strong associations found for the individual *Evaluating strategies* (see Table 5.30).

5.7.2 Strategies of the Planning Process

Table 5.27 (below) provides *Kendall's tau-b* results to illustrate the association between instructors' perceptions of the relevance of strategies and the incorporation of these strategies into teaching the MSC. There was an unexpected result in that while **instructors in both disciplines** commonly reported on the incorporation of *Planning strategies* into their teaching, this did not always relate to their perceptions of relevance. Table 5.27 also shows there were substantial differences between the two disciplines.

Table 5.27 (INSTRUCTORS) Association between the perceived relevance and incorporation of planning strategies in teaching MSC: Kendall's tau-b

Planning Strategies	Ag. Sci.[1]		Comm. Arts[2]	
	tau-b[3]	*p*	tau-b[3]	*p*
1. Goal setting	0.67	*<0.01*[*]	0.27	*0.60*
2. Directing attention selectively	0.27	*0.60*	0.61	*0.17*
3. Linking with prior knowledge	0.53	*0.17*	0.72	*<0.01*[*]
4. Expecting the encountered problem	0.80	*<0.01*[*]	-0.38	*0.23*
5. Intending to ignore distractions/ inappropriate thoughts	0.71	*0.04*[*]	0.00	*1.00*
6. Preparing to confront obstacles	-0.61	*0.17*	0.82	*<0.01*[*]
7. Predicting outcomes/answers	0.22	*0.66*	0.50	*0.14*
8. Predicting the incoming information	0.53	*0.17*	-[4]	-[4]
9. Choosing strategies for the task	0.14	*0.74*	-0.18	*0.58*
10. Work ordering	-0.29	*0.44*	-0.61	*0.17*

1 N = 5
2 N = 5
3 Kendall's tau-b coefficient
4 No statistics calculated because all respondents rated the relevance of the strategy as 'neutral'.
* Significant at or beyond the 0.05 level

The instructors in **Agricultural Sciences** showed a significant positive relationship between the incorporation in teaching and their perceptions of relevance of strategies nos. 1 *'goal setting'*, 4 *'expecting the encountered problem'* and 5 *'intending to ignore distractions'*. There were negative relationships for strategies nos. 6 *'preparing to confront obstacles'* and 10 *'work ordering',* indicating that the incorporation of these strategies did not relate to the instructors' perceptions about their relevance. *Crosstabulations* of the incorporation and relevance variables showed that two instructors perceived strategy no. 6 as highly relevant, but only reported sometimes implicitly and sometimes explicitly including it in their teaching. For strategy no. 10, two out of the five instructors perceived it as less relevant, but reported sometimes and always explicitly incorporating it into their teaching.

The **Communication Arts** instructors showed that there was a significant positive relationship between the incorporation in teaching and their perceived relevance of strategies nos. 3 *'linking with prior knowledge'* and 6 *'preparing to confront obstacles'*. There were negative but non-significant relationships for strategies nos. 4 '*expecting the encountered problem'*, 9 *'choosing strategies for the task'* and 10 *'work ordering'*. *Crosstabulations* showed that some instructors perceived these strategies as less relevant but more frequently included them in teaching, whereas for others, the reverse was true. Interestingly, no statistics could be computed for strategy no.8 *'predicting the incoming information'* because all respondents rated the perceptions of its relevance as *neutral*, with two instructors *always explicitly including* it in their teaching and three *sometimes explicitly including* it. These results are reflected in the lack of significance of the relationship for the process as a whole.

5.7.3 Strategies of the Monitoring Process

Kendall's tau-b tests (see Table 5.28 below) indicate that there were marked differences in the relationship between the incorporation in teaching and the perceptions of relevance of *Monitoring strategies* among **instructors in both disciplines.** There was a strongly positive significant relationship for seven *Monitoring strategies* in Agricultural Sciences, but for only two strategies in Communication Arts.

Instructors in **Agricultural Sciences** showed a significant positive relationship for all strategies except nos. 3, 6 and 7. There was a negative relationship for strategy no. 6 *'checking the attention'* reflecting the fact that the instructors reported incorporating it into teaching, but strongly disagreed as to its relevance. The zero coefficients for strategy no. 7 *'checking the appropriateness of the information'* indicate that these instructors incorporated the strategy did not relate to their perceptions of its relevance. One always explicitly included it, but rated neutral for its relevance. Others sometimes implicitly or sometimes incorporated it into teaching although they agree to its relevance.

Table 5.28 (INSTRUCTORS) Association between the perceived relevance and incorporation of monitoring strategies in teaching MSC: Kendall's tau-b

Monitoring Strategies	Ag. Sci.[1]		Comm. Arts[2]	
	tau-b[3]	*p*	tau-b[3]	*p*
1. Comprehension check	0.80	*<0.01**	-0.29	*0.54*
2. Checking progress	0.62	*0.02**	0.82	*<0.01**
3. Detecting weaknesses/obstacles	0.76	*0.14*	0.31	*0.50*
4. Seeking related prior knowledge	0.89	*<0.01**	0.62	*0.02**
5. Checking the retrieval of required information	1.00	*<0.01**	0.12	*0.81*
6. Checking the attention	-0.61	*0.17*	0.25	*0.60*
7. Checking appropriateness of the strategy being used	0.00	*1.00*	0.00	*1.00*
8. Checking importance of the information	1.00	*<0.01**	0.00	*1.00*
9. Checking linkage to other subjects	0.72	*<0.01**	0.25	*0.23*
10. Checking the predictions/answers	0.87	*<0.01**	-[4]	-[4]

1 N = 5
2 N = 5
3 Kendall's tau-b coefficient
4 No statistics could be computed because all five instructors rated the relevance of this strategy as 'neutral'
* Significant at or beyond the 0.05 level

The **Communication Arts** instructors showed that the inclusion of *Monitoring strategies* in their teaching did not always relate to their perceptions of relevance. Only the incorporation of strategies nos. 2 and 4 related significantly to their perceptions of relevance. All instructors claimed the explicit teaching (including *sometimes*, *regularly* or *always*) of all strategies whether they perceived them as relevant or not. No statistic could be calculated for strategy no. 10 *'checking correctness of the predictions'* because all five instructors rated its relevance as neutral.

5.7.4 Strategies of the Problem-solving Process

Table 5.29 (below) shows the results of *Kendall's tau-b* test of associations between the perceived relevance of *Problem-solving strategies* and their incorporation in teaching by the **Agricultural Science and Communication Arts** instructors. Instructors in the two disciplines showed different results (e.g., see nos. 1, 3, 4, 6 and 7). For the Agricultural Science instructors, the positive relationship between relevance and incorporation shows that they tended to explicitly incorporate in their teaching those strategies they strongly perceived as relevant, but not incorporate the strategies they saw as less relevant. Communication Arts instructors showed a significant positive relationship for only five strategies. This could be linked to the demand for more prescriptive information in the Sciences as compared to greater use of cooperative learning tasks in Communication Arts.

Table 5.29 (INSTRUCTORS) Association between the perceived relevance and incorporation of *problem-solving* strategies in teaching MSC: Kendall's tau-b

Problem-Solving Strategies	Ag. Sci.[1]		Comm. Arts[2]	
	tau-b[3]	*p*	tau-b[3]	*p*
1. Revising the plan	0.62	*0.01**	-0.38	*0.23*
2. Accessing various resources	0.62	*0.02**	0.68	*<0.01**
3. Ignoring problems	0.72	*<0.01**	-0.38	*0.46*
4. Asking for clarification	0.87	*<0.01**	-[4]	-[4]
5. Linking with prior knowledge	0.53	*0.17*	0.80	*<0.01**
6. Seeking peer support	0.82	*<0.01**	0.00	*1.00*
7. Trying alternatives	0.80	*<0.01**	-0.14	*0.82*
8. Making new guesses	0.71	*0.04**	0.59	*<0.01**
9. Logic reasoning	1.00	*<0.01**	0.95	*<0.01**
10. Self-encouragement	1.00	*<0.01**	0.94	*<0.01**

1 N = 5
2 N = 5
3 Kendall's tau-b coefficient
4 No statistics could be computed because all five instructors selected 'agree' in rating the relevance of the strategy.
* Significant at or beyond the 0.05 level

As is evident in Table 5.29 below, instructors in the **Agricultural Sciences** showed a significant positive relationship between the incorporation in teaching and relevance of 9 out of the 10 *Problem-solving strategies*. Interestingly, even though only one individual strategy (i.e., no.5 *'linking with prior knowledge'*) yielded a non-significant result, the relationship for *Problem-solving* process as a whole did not approach statistical significance.

The incorporation of *Problem-solving strategies* nos. 2, 5, 8, 9 and 10 by **Communication Arts** instructors significantly related to their perceptions of relevance. There was negative relationship for strategies nos. 1, 3 and 7, indicating that some instructors rarely included these strategies in teaching even though they saw them as highly relevant, or vice versa. No statistic could be computed for strategy no.4 *'asking for clarification'* because all instructors selected 'agree' in rating its relevance.

5.7.5 Strategies of the Evaluating Process

Tests of association between incorporation in teaching and instructors' perceptions of relevance of *Evaluating strategies* (see Table 5.30 below) show difference across **the two**

disciplines. There was a significant positive relationship for eight *Evaluating strategies* in Agricultural Sciences as opposed to four strategies in Communication Arts. As a result, the relationship between relevance and incorporation for the whole process was statistically significant only for instructors in Agricultural Sciences.

Table 5.30 (INSTRUCTORS) Association between the perceived relevance and incorporation of *evaluating* strategies in teaching MSC: Kendall's tau-b

Evaluating Strategies	Ag. Sci.[1]		Comm. Arts[2]	
	tau-b[3]	*p*	tau-b[3]	*p*
1. Judging that the goal has been met	0.62	*0.02**	0.93	*<0.01**
2. Strategy suitability & effectiveness	-[4]	-[4]	0.17	*0.71*
3. Within subject applicability	0.33	*0.32*	0.41	*0.23*
4. Other areas applicability	0.67	*0.02**	1.00	*<0.01**
5. Seeking other suitable strategy	1.00	*<0.01**	0.76	*0.14*
6. Summarizing lesson	0.62	*0.02**	0.76	*0.14*
7. Judging how much learned	0.59	*<0.01**	0.29	*0.44*
8. Assessing correctness of the predictions	1.00	*<0.01**	0.72	*<0.01**
9. Comparing new knowledge with known knowledge	1.00	*<0.01**	0.93	*<0.01**
10. Judging worthiness of learning	1.00	*<0.01**	0.53	*0.17*

1 N = 5
2 N = 5
3 Kendall's tau-b coefficient
4 No statistics could be computed because all five instructors stated they 'sometimes explicitly include' the strategy.
* Significant at or beyond the 0.05 level

There was a positive relationship between **Agricultural Sciences** instructors' incorporation of 8 out of the 10 individual *Evaluating strategies* into teaching and their perceptions of strategy relevance. No statistic could be computed for strategy no. 2 *'strategies applicability & effectiveness'* because all five instructors stated they 'sometimes explicitly include' the strategy in their teaching. Although the relationship for strategy no. 3 *'(judging) strategy applicability & effectiveness'* was non-significant, this did not prevent the whole process from achieving a perfect and statistically significant relationship (see Table 5.26). That is, all instructors who directly and repeatedly included the strategies, also agreed as to their relevance while those who only sometimes indirectly taught the strategies recorded that they did not see them as relevant.

For the **Communication Arts instructors,** there was a significant positive relationship for *Evaluating strategies* nos. 1, 4, 8 and 9 only and a perfect one-to-one relationship for strategy no. 4 '(judging) *other area applicability'*. However, these results did not distribute to statistical significance for the relationship of the whole process for Communication Arts instructors (see Table 5.26).

5.8 RELEVANCE TO INSTRUCTORS AND USE BY STUDENTS

Due to the small number of instructor informants, it would have been problematic to use inferential statistics to test for significant differences between the instructors' and students' ratings of the metacognitive strategies. Therefore, whether instructors' perceptions of relevance related to their students' use of the overall metacognitive process was examined using a comparison between median and range. For the individual strategies, the relationship between the instructors' perceptions about relevance and their actual use by students was examined by comparing the per cent agreement to per cent use. Per cent agreement is the per cent of instructors who *'agreed'* or *'strongly agreed'* that the strategy was relevant to learning the MSC. Per cent use is the per cent of students who *'often used'* or *'always used'* the strategy in learning the MSC.

5.8.1 Overall Metacognitive Process

When the use of each metacognitive process by **students in both disciplines** was related to their instructors' perceptions of relevance (see Table 5.31), there was some degree of mismatch between the two groups. The medians on use by Agricultural Science students were slightly lower than those of their instructors' on perceptions of relevance. Conversely, the medians of students in Communication Arts were slightly higher than those of their instructors. It is important to note, however, that these differences may not represent discernable difference in actual practice because most of the medians are in the mid 30s.

The similar level of ratings by both instructors and students in **Agricultural Sciences** made on three processes (i.e., *Planning, Monitoring* and *Evaluating*) indicates that, to some extent, students' strategy choices related to their instructors' perceived relevance. However interestingly, while the instructors perceived *Problem-solving* as very relevant, their students did not use the process any more than any other process. As seen in section 5.6.4, these instructors did not always explicitly teach this process to their students.

Table 5.31 Relevance of metacognitive strategies in teaching by instructors compared to frequency of use by students.

	Median[1]				Range[4]			
	Ag.Sci.[2]		Comm.Arts[3]		Ag.Sci.		Comm.Arts	
	Instructors	*Students*	Instructors	*Students*	Instructors	*Students*	Instructors	*Students*
Planning	33.0	***32.0***	31.0	***35.0***	**12**	***21***	**16**	***24***
Monitoring	36.0	***35.0***	33.0	***37.0***	**9**	***21***	**17**	***29***
Problem-Solving	40.0	***34.0***	33.0	***34.5***	**9**	***27***	**13**	***25***
Evaluating	35.5	***35.0***	36.0	***39.0***	**7**	***31***	**15**	***30***

1 Minimum score = 10, maximum score = 50
2 Agricultural Science Instructor N = 5; Student N = 34
3 Communication Arts Instructor N = 5; Student N = 44
4 Maximum range = 40

The **Communication Arts** students' median scores for use of the four metacognitive processes were higher than those for their instructors' perceptions about relevance. The following sections will examine whether students' use particular metacognitive strategies regardless of their instructors' perceptions about the importance or relevance of those strategies.

5.8.2 Strategies of the Planning Process

As seen on Table 5.32 below, the **Agricultural Science and Communication Arts students'** use of individual *Planning strategies* are matched with their instructors' views about relevance. While 22 per cent of students in the Agricultural Sciences frequently used strategy no. 7 *'predicting outcomes'* and more than half of Communication Arts students frequently used no. 8 *'predicting the incoming information',* no instructors (respectively) saw these strategies as relevant. Strategies nos. 2 *'directing attention selectively'* and 3 *'linking with prior knowledge'* were perceived as relevant and frequently used in Communication Arts but not in Agricultural Science. This might be indicative of differences in lecture structure and content for the two disciplines.

In the **Agricultural Science** content area, the students' ratings for usage tended to match their instructors' ratings on relevance. A notable exception was strategy no. 9 *'choosing strategies for the task',* which was seen as relevant to most of the instructors, but relatively few students reported using it 'often' or 'always'.

Table 5.32 PLANNING - Relevance of strategies to instructors compared to use by students.

Planning Strategies		Ag. Sci.[1]		Comm. Arts[2]	
		Relevance to Instructors % Agreement[3]	*Use by Students % Frequent Use[4]*	Relevance to Instructors %Agreement[3]	*Use by Students % Frequent Use*
1.	Goal setting	40	*35*	40	*32*
2.	Directing attention selectively	20	*26*	60	*56*
3.	Linking with prior knowledge	40	*27*	60	*61*
4.	Expecting the encountered problem	40	*38*	60	*48*
5.	Intending to ignore distractions/ inappropriate thoughts	60	*48*	40	*72*
6.	Preparing to confront obstacles	40	*58*	40	*66*
7.	Predicting outcomes/answers	0	*22*	40	*43*
8.	Predicting the incoming information	20	*38*	0	*55*
9.	Choosing strategies for the task	60	*27*	40	*53*
10.	Work ordering	60	*58*	60	*68*

1 Ag.Sci.: No. of instructors = 5; No. of students = 34
2 Comm.Arts: No. of instructors = 5; No. of students = 44
3 Per cent of instructors who 'agree' or 'strongly agree' that the strategy is relevant to learning MSC
4 Per cent of students who 'often use' or 'always use' the strategy in learning MSC

Communication Arts students' responses on usage matched their instructors' perceptions of relevance for all but three strategies (i.e., nos. 5, 6 and 8 in Table 5.31 above) which the students used frequently even though their instructors did not rate them as highly relevant. This lower rating on relevance than student usage might demonstrate the potential implicit influence that instructors can have on their students. As discussed in Chapter 2 (section 2.1.2), this might be because these students accept the superior status of an instructor who is in charge of transmitting knowledge. Moreover, just a few instructors perceiving that a strategy is relevant and including it in their teaching can inspire a large number of students to use that strategy. Alternatively, it might indicate that some students have used appropriate strategies independently of their instructors' advice.

5.8.3 Strategies of the Monitoring Process

Table 5.33 (below) shows that for **both disciplines,** the students' use of *Monitoring strategies* did not always relate to their instructors' perceptions of relevance. However, overall instructors' perceptions were more closely related to their students' use of *Monitoring strategies* in Agricultural Science than in Communication Arts.

Table 5.33 MONITORING - Relevance of strategies to instructors compared to use by students.

Monitoring Strategies		Ag. Sci.[1]		Comm. Arts[2]	
		Relevance to Instructors % Agreement[3]	*Use by Students % Frequent Use[4]*	Relevance to Instructors %Agreement[3]	*Use by Students % Frequent Use*
1.	Comprehension check	80	*36*	40	*60*
2.	Checking progress	40	*55*	40	*64*
3.	Detecting weaknesses/obstacles	80	*61*	40	*62*
4.	Seeking related prior knowledge	40	*38*	60	*60*
5.	Checking the retrieval of required information	80	*55*	60	*55*
6.	Checking the attention	80	*65*	40	*70*
7.	Checking appropriateness of the strategy being used	40	*37*	40	*58*
8.	Checking importance of the information	60	*53*	40	*67*
9.	Checking linkage to other subjects	40	*39*	20	*50*
10.	Checking the predictions/answers	40	*33*	0	*26*

1 Ag.Sci.: No. of instructors = 5; No. of students = 34
2 Comm.Arts: No. of instructors = 5; No. of students = 44
3 Per cent of instructors who 'agree' or 'strongly agree' that the strategy is relevant to learning MSC
4 Per cent of students who 'often use' or 'always use' the strategy in learning MSC

The **Agricultural Science** students' use of strategies nos. 4, 7, 8, 9 and 10 tended to parallel their instructors' recognition of relevance. A weaker relationship was evident for strategies nos. 2, 3, 5 and 6. Strategy no. 1 *'comprehension check'* is notable in that it was considered relevant by most of the instructors but not frequently used by the students. Some explanation for this may be offered by the interview findings where most instructors reported taking the lead role in checking students' understanding and one instructor even stressed that it was an instructor's duty to do so. This may have led to the students not taking on the responsibility for checking comprehension.

As seen in Table 5.33 (above) there was greater frequency of use of *Monitoring strategies* by **Communication Arts** compared with the perceived relevance recorded by their instructors (i.e., nos.1-3 and 6-10). However, a close parallel in student use and instructors' perceptions occurred for strategies nos. 4 *'seeking related prior knowledge'* and 5 *'checking the retrieval of expected information'*.

5.8.4 Strategies of the Problem-solving Process

Table 5.34 (below) compares the use of *Problem-solving strategies* and instructors' perceptions of relevance **in both disciplines**. Strategies used by students in the Agricultural

Sciences showed little relationship with their instructors' perceptions about relevance whereas the Communication Arts students' use of these strategies was more closely matched to their instructors' views.

Table 5.34 PROBLEM-SOLVING - Relevance of strategies to instructors compared to use by students.

Problem-Solving Strategies	Ag. Sci.[1]		Comm. Arts[2]	
	Relevance to Instructors % Agreement[3]	*Use by Students % Frequent Use[4]*	Relevance to Instructors %Agreement[3]	*Use by Students % Frequent Use*
1. Revising the plan	80	*53*	60	*59*
2. Accessing various resources	100	*29*	60	*52*
3. Ignoring problems	0	*36*	20	*17*
4. Asking for clarification	60	*48*	100	*45*
5. Linking with prior knowledge	60	*41*	60	*64*
6. Seeking peer support	40	*55*	40	*44*
7. Trying alternatives	60	*53*	20	*60*
8. Making new guesses	80	*44*	20	*51*
9. Logic reasoning	80	*47*	40	*36*
10. Self-encouragement	80	*55*	60	*84*

1 Ag.Sci.: No. of instructors = 5; No. of students = 34
2 Comm.Arts: No. of instructors = 5; No. of students = 44
3 Per cent of instructors who 'agree' or 'strongly agree' that the strategy is relevant to learning MSC
4 Per cent of students who 'often use' or 'always use' the strategy in learning MSC

As seen in Table 5.34 how frequently **Agricultural Science** students used *Problem-solving strategies* did not always relate to their instructors' perceptions of relevance. A closer relationship was found between strategies nos. 1, 4, 5, 6, 7 and 10 than between nos. 2, 3, 8 and 9. Strategy no. 3 *'ignoring problems'* was rated low for both its relevance and its use. As the strategy itself does not help one to overcome an obstacle, it is not surprising that the ratings by both groups of informants were low. Strategy no. 2 *'accessing various resources'* was considered relevant by all instructors but used by only 36 per cent of students. This result supports the findings of many previous studies in Thailand presented in Chapter 2 (section 2.1.2) that Thai undergraduate students were not likely to study independently. Also some Agricultural Science remarked in their interviews that not many students spent extra time studying and practising even though materials and instruments were provided.

The use of *Problem-solving strategies* by students in **Communication Arts** was more likely to match what their instructors perceived as relevant. Higher percentages among both instructors and students in this field occurred in four strategies (i.e., nos.1, 2, 5 and 10). As seen for Agricultural Sciences, strategy no. 3 *'ignoring problems'* attracted low percentages from the Communication Arts instructors and students. Low percentages were also shared by instructors and students for strategy no. 6 *'seeking peer support'* and no. 9 *'logic reasoning',* suggesting that these strategies might be less important for many Communication Arts tasks. Strategies nos. 7 *'trying alternatives'* and 10 *'self-encouragement'* were used more frequently by students than perceived relevant by instructors, while the reverse seems to be the case for strategy no. 4 '*asking for clarification*' suggesting more independent learning on the part of Communication Arts students. Contrary to these results, most Communication Arts instructors in their interviews reported the relevance of *'trying out alternatives'* and its incorporation in teaching. Students' frequent use of this strategy might be because these students are challenged by less instructive tasks or because their instructors provide appropriate teaching opportunities such as learning how professionals coped with the problems and discussing the problems students would have faced.

5.8.5 Strategies of the Evaluating Process

Table 5.35 (below) provides a comparison between instructors' ratings of the relevance of *Evaluating strategies* and the students' use of these strategies. In general, the Communication Arts students' ratings for use were higher than their instructors' ratings for relevance, whereas the reverse was true for the Agricultural Sciences. This trend is similar to that seen for the *Monitoring strategies* (see section 5.8.3 and Table 5.33).

Table 5.35 EVALUATING - Relevance of strategies to instructors compared to use by students

Evaluating Strategies	Ag. Sci.[1]		Comm. Arts[2]	
	Relevance to Instructors % Agreement[3]	*Use by Students % Frequent Use[4]*	Relevance to Instructors %Agreement[3]	*Use by Students % Frequent Use*
1. Judging that the goal has been met	80	*56*	60	*73*
2. Strategy suitability & effectiveness	80	*44*	40	*69*
3. Within subject applicability	75	*35*	40	*60*
4. Other areas applicability	60	*59*	60	*76*
5. Seeking other suitable strategy	80	*44*	60	*67*
6. Summarizing lesson	100	*56*	60	*69*
7. Judging how much learned	80	*44*	60	*70*
8. Assessing correctness of the predictions	20	*47*	60	*42*
9. Comparing new knowledge with known knowledge	40	*59*	40	*69*
10. Judging worthiness of learning	60	*62*	60	*67*

1 Ag.Sci.: No. of instructors = 5; No. of students = 34
2 Comm.Arts: No. of instructors = 5; No. of students = 44
3 Per cent of instructors who 'agree' or 'strongly agree' that the strategy is relevant to learning MSC
4 Per cent of students who 'often use' or 'always use' the strategy in learning MSC

A mismatch between students and instructors in **Agricultural Sciences** occurred for most *Evaluating strategies* (i.e., nos.1-3, 5, 6, 7 and 8 in Table 5.35 above) indicating that students' use of these strategies had little relationship with their instructors' perceptions of relevance. However, for strategies nos. 4, 9 and 10, there was a closer match. Low ratings were given by both groups to strategy no. 8 *'assessing correctness of predictions'*. As this strategy is an integral process of every laboratory experiment, it might that instructors and students in Agricultural Science take it for granted and are not consciously aware of its relevance or use.

As pointed out above, the **Communication Arts** students' ratings on the use of *Evaluating strategies* were higher than their instructors' ratings on perceived relevance except for no.8 *'assessing correctness of the predictions'*. The latter finding is perhaps linked to Communication Arts students' low ratings of the use of *Planning strategy* no. 7 *'predicting outcomes'* (see Table 5.12). Further discussion of this will be presented in chapter 9.

5.9 INCORPORATION IN TEACHING BY INSTRUCTORS AND USE BY STUDENTS

Because of the small number of instructor informants, it was not possible to use statistical tests (such as *Spearman's Rank Order Correlations (rho)*) to measure the strength of relationship between the students' use of the four metacognitive processes and their instructors' incorporation of these processes in their teaching. Thus, in considering the relationship between instructors' incorporation of metacognitive processes and students' actual use of the processes, comparisons were made between the medians and range of the scores. For the individual metacognitive strategies, the per cent of instructors who *'sometimes explicitly include in teaching'* or *'always explicitly include in teaching'* was compared with the per cent of students who *'often use'* or *'always use'* the strategy in learning MSC.

5.9.1 Overall Metacognitive Strategies

As seen in Table 5.36 below, the median scores for the instructors and students in each discipline were mostly in the mid to high 30s, suggesting that, overall, there is a considerable amount of similarity between the students' use of metacognitive processes and their instructors' incorporation of the processes into their teaching. However, a closer look at the individual strategies may reveal some differences.

Table 5.36 Incorporation of metacognitive strategies in teaching by instructors compared to frequency of use by students.

	Median[1]				Range[4]			
	Ag.Sci.[2]		Comm.Arts[3]		Ag.Sci.		Comm.Arts	
	Instructors	***Students***	Instructors	***Students***	Instructors	***Students***	Instructors	***Students***
Planning	36.5	*32.0*	40.0	*35.0*	8	*21*	12	*24*
Monitoring	37.0	*35.0*	36.5	*37.0*	10	*21*	13	*29*
Problem-Solving	39.0	*34.0*	39.0	*34.5*	4	*27*	6	*25*
Evaluating	34.0	*35.0*	36.0	*39.0*	10	*31*	10	*30*

1 Minimum score = 10, maximum score = 50
2 Agricultural Science Instructor N = 5; Student N = 34
3 Communication Arts Instructor N = 5; Student N = 44
4 Maximum range = 40

5.9.2 Strategies of the Planning Process

As seen in Table 5.37 below, the use of individual *Planning strategies* by students in **the two disciplines** did not always relate to their instructors' incorporation of these strategies into teaching. The Communication Arts students' choice of strategies showed a weaker relationship to their instructors' teaching than did Agricultural Science students. This might be indicative of the different nature of learning tasks in the two disciplines as reported in the interviews (see Chapter 4, section 4.3). The students' per cent frequent use (including *often use* and *always use*) diverged substantially from the instructors' per cent explicit incorporation on 6 strategies for both Agricultural Sciences and Communication Arts.

Ratings on frequency of use of *Planning strategies* by students in **Agricultural Sciences** were relatively compatible to their instructors' incorporation into teaching for only 4 strategies (i.e., nos.1, 3, 7 and 8 in Table 5.37). Interestingly, these were all instances of low usage. Students were more likely to use strategies nos. 6 and 10 which, as mentioned in previous sections involving *Planning strategies,* might result from highly instructive tasks whereby activities are made clear beforehand or are very closely guided. Such an over explicit teaching model may prevent students from using more independent learning strategies such as 1, 3, 7 and 8. This might also be consistent with the results of strategy 9 where students seem to fail to employ independent learning even when it is recommended by the instructors.

Table 5.37 PLANNING – Incorporation of strategies in teaching by instructors compared to frequency of use by students.

Planning Strategies	Ag. Sci.[2]		Comm. Arts[3]	
	Instructors	***Students***	**Instructors**	***Students***
	% Explicitly Incorporate	***% Frequent Use***	**% Explicitly Incorporate**	***% Frequent Use***
1. Goal setting	40	*35*	80	*32*
2. Directing attention selectively	60	*26*	80	*56*
3. Linking with prior knowledge	20	*27*	100	*61*
4. Expecting the encountered problem	60	*38*	80	*48*
5. Intending to ignore distractions/ inappropriate thoughts	80	*48*	75	*72*
6. Preparing to confront obstacles	80	*58*	60	*66*
7. Predicting outcomes/answers	25	*22*	60	*43*
8. Predicting the incoming information	40	*38*	40	*55*
9. Choosing strategies for the task	80	*27*	100	*53*
10. Work ordering	80	*58*	100	*68*

1 Combined categories:
2 Ag.Sci: Instructors = 5; Students = 34
3 Comm.Arts: Instructors = 5; Students = 44

Communication Arts students' frequency of use of *Planning strategies* tended to match to their instructors' incorporation in teaching for nos. 5, 6 and 8. Strategies nos. 1, 4 and 7 were explicitly incorporated in teaching by most instructors, but were not widely used by their students. This suggests that many students might have not reached the level of sophistication in their learning, which required these strategies, or the tasks they performed did not challenge their use of these strategies. Other strategies were use more frequently.

5.9.3 Strategies of the Monitoring Process

Students in **the two fields** showed that their use of *Monitoring strategies* did not always matched the strategies incorporated into teaching by their instructors (see Table 5.38 below).

In the **Agricultural Sciences**, relatively high levels of use and incorporation were reported by the students and instructors for *Monitoring strategies* nos. 2, 3, 5, 6 and 8. On the other hand, neither students nor their instructors rated strategies nos. 7 and 10 highly. Since strategy no. 7 *'checking appropriateness of the strategy being used'* is a rather high level cognitive skill, this might explain why not many students used it. The low frequent use of no. 10 *'checking the predictions'* might be linked to the low ratings also seen for *Planning strategy* no. 7 *'predicting outcomes'*. Relatively few Agricultural Science students reported the use of nos. 1, 4 and 9, in spite of their instructors' teaching. As results from the interviews reveal, the *'comprehension check'* (strategy no. 1) and *'seeking related prior knowledge'* (strategy no. 4) might be over modelled by instructors in this field. The interview findings also suggest that many students in Agricultural Sciences are so accustomed to applying knowledge from various Sciences that they did not see it as an independent strategy and did not *'check linkage to other subjects'* (strategy no. 9).

Table 5.38 MONITORING – Comparison between incorporation of strategies in teaching and frequency of use by students.

	Monitoring Strategies	Ag. Sci.[2] Instructors % Explicitly Incorporate	Ag. Sci.[2] *Students % Frequent Use*	Comm. Arts[3] Instructors % Explicitly Incorporate	Comm. Arts[3] *Students % Frequent Use*
1.	Comprehension check	80	*36*	40	*60*
2.	Checking progress	60	*55*	60	*64*
3.	Detecting weaknesses/obstacles	80	*61*	40	*62*
4.	Seeking related prior knowledge	60	*38*	75	*60*
5.	Checking the retrieval of required information	80	*55*	80	*55*
6.	Checking the attention	100	*65*	60	*70*
7.	Checking appropriateness of the strategy being used	40	*37*	60	*58*
8.	Checking importance of the information	60	*53*	80	*67*
9.	Checking linkage to other subjects	60	*39*	60	*50*
10.	Checking the predictions/answers	40	*33*	40	*26*

1 Combined categories:
2 Ag.Sci: Instructors = 5; Students = 34
3 Comm.Arts: Instructors = 5; Students = 44

In the **Communication Arts,** the *Monitoring strategies* that were frequently used by the majority of students (i.e., nos. 2, 4, 5, 6, 7, 8 and 9 in Table 3. 38 above) tended to be those that most of their instructors incorporated in their teaching. Exceptions to this were strategies 1 and 3, which were frequently used by at least 60 per cent of students, but were less likely to be incorporated in teaching by their instructors. This suggests that some students are using strategies learnt from elsewhere. Only strategy no. 10 was not used frequently and not frequently incorporated into teaching. As reasoned for the Agricultural Sciences above, this result might relate to the low ratings on *Planning strategy* no. 7 by both instructors and students. See further discussion in Chapter 9.

5.9.4 Strategies of the Problem-solving Process

Informants in **the two disciplines** showed some relationship between teaching and use of the *Problem-solving strategies.* Overall there was a slightly stronger connection between Communication Arts students' use of strategies and their instructors' explicit incorporation of strategies into teaching than there was for Agricultural Sciences (see Table 5.39).

Table 5.39 (below) reveals that, overall, *Problem-solving strategies* were not used frequently by **Agricultural Science** students, despite the fact that most of them (except nos. 3 and 6) were deemed to be incorporated into teaching by their instructors. The most highly reported use (55 per cent) was for nos. 6 *'seeking peer support'* and 10 *'self-encouragement'*. The lowest frequency of use was no. 2 *'accessing various resources'*. This is not consistent with the interviews where almost every student reported using this strategy. However, this links to two instructors' observations that not many students did further study, even though additional materials and instruments were provided. This suggests that students were reluctant to look past their set texts, even when advised to do so by the instructors.

Table 5.39 PROBLEM-SOLVING – Comparison between incorporation of strategies in teaching and frequency of use by students.

Problem-Solving Strategies	Ag. Sci.[2]		Comm. Arts[3]	
	Instructors	***Students***	Instructors	***Students***
	% Explicitly Incorporate	*% Frequent Use*	% Explicitly Incorporate	*% Frequent Use*
1. Revising the plan	80	*53*	80	*59*
2. Accessing various resources	80	*29*	40	*52*
3. Ignoring problems	40	*36*	20	*17*
4. Asking for clarification	100	*48*	100	*45*
5. Linking with prior knowledge	100	*41*	80	*64*
6. Seeking peer support	40	*55*	60	*44*
7. Trying alternatives	80	*53*	25	*60*
8. Making new guesses	60	*44*	25	*51*
9. Logic reasoning	80	*47*	40	*36*
10. Self-encouragement	80	*55*	60	*84*

1 Combined categories:
2 Ag.Sci: Instructors = 5; Students = 34
3 Comm.Arts: Instructors = 5; Students = 44

The strong relationship with teaching and higher ratings on the use of the *Problem-solving strategies* in **Communication Arts** suggests that these students had been taught to use different strategies independently. Strategy no. 10 *'self-encouragement'* was rated highly by

Communication Arts students (84 per cent) and is perhaps indicative of the discipline of study. No. 3 *'ignoring problem'* scored the lowest for both instructors and students (i.e., 20 per cent and 17 per cent, respectively), again supporting the increased independent learning in this discipline. Perhaps more consistent with independent learning is the Communication Arts students' relatively low ratings of strategies no. 4 *'asking for clarification'* and no. 6 *'seeking peer support'*.

5.9.5 Strategies of the Evaluating Process

As with *Problem-solving strategies,* overall, the similarity between students' use of *Evaluating strategies* and their instructors' incorporation of the strategies in their teaching was greater for Communication Arts than Agricultural Science (see Table 5.40 below). Strategy no. 2 *'strategy suitability & effectiveness'* is notable in that it was used more highly by Communication Arts students than incorporated into teaching by their instructors, whereas the reverse occurred in the Agricultural Sciences. This strategy is rather a high level metacognitive skill and, although it is included in teaching, it may take time for many students to use it independently.

Table 5.40 EVALUATING – Comparison between incorporation of strategies in teaching and frequency of use by students.

Evaluating Strategies	Ag. Sci.[2] Instructors % Explicitly Incorporate	Ag. Sci.[2] *Students % Frequent Use*	Comm. Arts[3] Instructors % Explicitly Incorporate	Comm. Arts[3] *Students % Frequent Use*
1. Judging that the goal has been met	100	*56*	60	*73*
2. Strategy suitability & effectiveness	100	*44*	40	*69*
3. Within subject applicability	25	*35*	80	*60*
4. Other areas applicability	40	*59*	60	*76*
5. Seeking other suitable strategy	80	*44*	80	*67*
6. Summarizing lesson	80	*56*	80	*69*
7. Judging how much learned	60	*44*	60	*70*
8. Assessing correctness of the predictions	20	*47*	40	*42*
9. Comparing new knowledge with known knowledge	40	*59*	40	*69*
10. Judging worthiness of learning	60	*62*	80	*67*

1 Combined categories:
2 Ag.Sci: Instructors = 5; Students = 34
3 Comm.Arts: Instructors = 5; Students = 44

Both **Agricultural Science and Communication Arts informants** gave relatively low ratings to strategy no. 8 *'assessing correctness of predictions'*. This strategy might not be considered as important for the Communication Arts. In the interviews, the Agricultural Science informants reported it as an important stage of scientific laboratory experiments. Perhaps the strategy is so familiar to the Agricultural Science informants that they no longer notice their use of it in learning or in teaching. In addition, strategy no. 9 *'comparing new knowledge with known knowledge'* was used more widely by students in both disciplines than it was incorporated in teaching either subject. This might be explained by two factors: either the students have learned this strategy somewhere else (see section 2.4.1), or they already engage independent learning tasks and do not notice if their instructors actively perform the tasks.

As is evident in Table 5.40, **Agricultural Science** students used strategies nos. 4 *'other area applicability'* and 9 *'comparing new knowledge with known knowledge'* independently of instruction. As mentioned in the previous paragraph, these strategies might support independent learning but not of concern to the instructors who were passive agents. However, students and instructors were more closely related in the ratings of nos. 1, 6 and 10.

Overall, **Communication Arts** students rated frequent use of the *Evaluating strategies* at the same level as their instructors' claimed explicit teaching with the exception of strategy no. 2 *'strategy suitability & effectiveness'* and 9 *'comparing new knowledge with known knowledge'*. These strategies were used more frequently than included in teaching and might be a factor in independent learning as mentioned above.

SUMMARY

Results from questionnaires reveal that there are clearly some differences between students in the Agricultural Science and Communication Arts in terms of the relevance and use of metacognitive strategies in the MSC. Communication Arts students perceived relevance and use a greater number of metacognitive strategies than their Agricultural Science peers. For instance, the 18 out of the 40 strategies (3 *Planning*; 7 *Monitoring*; 4 *Problem-solving* and 4 *Evaluating*) attracted agreement or strong agreement as relevant to learning the MSC by majority of Agricultural Science students (at least 60 percent) as opposed to 23 strategies (5 *Planning*; 5 *Monitoring*; 5 *Problem-solving* and 8 evaluating) in Communication Arts. In addition, minority of students (less than 50 per cent) rated 15 strategies as relevant to learning Agricultural Sciences (5 *Planning*; 2 *Monitoring*; 5 *Problem-solving* and 3 *Evaluating*) while 9 strategies were deemed relevant to learning Communication Arts (4 *Planning*; 1 *Monitoring*; 3 *Problem-solving* and 1 *Evaluating*). Regarding use, a limited of strategies (2 *Monitoring* and 1 *Evaluating*) were frequently used by majority of Agricultural Science students, while a wide range of strategies (23, i.e., 4 *Planning*; 6 *Monitoring*; 4 *Problem-solving* and 9 *Evaluating*) were frequently used by Communication Arts. Less than 50 per cent of Agricultural Science students used 23 out of the 40 strategies in learning the MSC (8 *Planning*; 5 *Monitoring*; 5 *Problem-solving* and 5 *Evaluating*) as opposed to 9 strategies in Communication Arts (3 *Planning*; 1 Monitoring; 4 *Problem-solving* and 1 *Evaluating*). Unlike their students, instructors in the two disciplines show less obvious discrepancy in their perceptions of relevance (24 strategies as opposed to 18 by majority of instructors in Agricultural Science and Communication Arts, respectively) and incorporation in teaching (28 strategies were frequently incorporated in teaching by 60 or more percent instructors in both disciplines).

Tests of correlation, using the *Spearman's Rank Order Correlations (rho)* for the four processes and *Kendall's tau-b* for their individual strategies, show that not many metacognitive strategies used by students often related to their perceptions of relevance. That is, very strong correlations (*tau-b* are between 70 and 89) exist for 26 out of 40 strategies (2 *Planning*; 6 *Monitoring*; 9 *Problem-solving* and 9 *Evaluating*) and a near perfect (*tau-b* is 90 or more) for 1 *Problem-solving strategy* in Communication Arts. In Agricultural Sciences, very strong associations between the students' use and perceptions of relevance are found for only 16 strategies (2 *Planning*; 4 *Monitoring*; 3 *Problem-solving* and 7 *Evaluating*). In addition, a very weak but significant relationship (*tau-b* < 30) exists for 'linking with prior knowledge', a strategy of *Planning* process.

The tests show that instructors in both fields incorporated fewer metacognitive strategies into teaching based on their perceptions of relevance. Interestingly, the reverse relationship seems to be true for the Agricultural Science and Communication Arts instructors. For the Agricultural Sciences, very strong correlations exist for 11 strategies (2 *Planning*; 4 *Monitoring* and 5 *Problem-solving*) and perfect relationships for 6 strategies (2 *Monitoring*; 2 *Problem-solving* and 4 *Evaluating*). While in Communication Arts, very strong associations are found for only 5 strategies (2 *Planning*; 1 *Monitoring*; 1 *Problem-solving* and 1 *Evaluating*); near perfect correlations exist for 4 strategies (2 *Problem-solving* and 2 *Evaluating*) and a perfect relationship for one *Evaluating strategy*.

Although a definite interpretation for relationships between instructors and students' responses cannot be carried out because of the small size of the instructor cohorts, there is some evidence that the students' use of metacognitive strategies related to their instructors' perceptions of relevance or incorporation of the strategies in teaching.

The next two chapters (Chapter 6 and 7) will present further findings from the questionnaires, in particular metacognitive strategies in learning English and the transfer of metacognitive strategies from learning the MSC to English.

6. METACOGNITIVE STRATEGIES IN LEARNING ENGLISH

OVERVIEW OF THE CHAPTER

This chapter reports on the informants' responses to the questionnaire with regard to learning English. As the research aims to find out about learners' existing metacognitive processes and whether these strategies are carried over to learning English, there was no instructor data for this section of the study. Also, due to the focus on independent learning in which listening and reading are the most common skills (see the discussion in Chapter 2 section 2.1.4), the investigation focused on English listening/reading tasks. Listening and reading tasks in English, as mentioned in the previous chapter, differ from listening and reading tasks in learning the major subject content. Thus, explanation or examples of individual strategies as applied to English tasks are provided in Appendix 3. In the body of the chapter, the perceived relevance and use of metacognitive strategies are presented separately, followed by the comparative analyses between students' perceptions of relevance and use of the strategies.

6.1 PERCEPTIONS OF RELEVANCE

This section presents students' perceived relevance of strategies of all four metacognitive processes when learning English. Findings of overall metacognitive processes are presented first, followed by strategies of the individual processes, i.e., *Planning, Monitoring, Problem-solving* and *Evaluating*.

6.1.1 Overall Metacognitive Process

To find out whether the two subject disciplines differed in their ratings of the relevance of four metacognitive processes, medians, ranges, numbers and *Mann-Whitney U* tests[20] were examined (see Table 6.1 below). (Appendix 6.1 provides eight frequency histograms to show the patterns of scores for each metacognitive process, by discipline.) Overall **students from both disciplines** tended to rate each of the metacognitive processes as moderately relevant to learning English. The median scores for Agricultural Science students ranged from 34.5 to 38 and from 34 to 38.5 for Communication Arts students, where the possible minimum score is 10

[20] The Mann-Whitney *U* Test is the non-parametric equivalent of the independent samples t-test. It analyses the separation between the two sets of scores. The more separated the sample group scores, the less reasonable it is to conclude that chance is responsible for the separation. NB: Since these are planned comparisons (rather than unplanned), the alpha level for each test (Ag.Sci vs Comm.Arts) remains at 0.05. Hence, to be statistically significant, the p value for the Mann-Whitney test statistic must be ≤ 0.05.

and possible maximum score is 50. No significant differences in ratings between the two disciplines were found (see Table 6.1).

Table 6.1 (STUDENTS) Perceived relevance of metacognitive processes in learning ENGLISH.

	Median		Range[1]		N		Mann-Whitney *U* Test			
							Mean Rank		Test Statistics	
	Ag.Sci	***Comm. Arts***	**Ag.Sci**	***Comm. Arts***	**Ag.Sci**	***Comm. Arts***	**Ag.Sci**	***Comm. Arts***	***Z***	***p***
Planning	35.5	*37.5*	27	*24*	32	*40*	32.9	*39.4*	-1.29	*0.20*
Monitoring	38.0	*38.5*	23	*24*	33	*42*	38.2	*37.8*	-0.08	*0.94*
Problem-Solving	34.5	*34.0*	28	*30*	30	*40*	34.1	*36.6*	-0.51	*0.61*
Evaluating	36.5	*37.0*	37	*24*	34	*40*	35.6	*39.1*	-0.70	*0.49*

1 Maximum range = 40

To determine whether perceived relevance differed significantly across the four processes within each discipline, the *Friedman* test was used.[21] The results were significant for both disciplines (i.e. Agricultural Science: $\chi^2 = 14.125$, df = 3, p = 0.003; Communication Arts: $\chi^2 = 7.765$, df = 3, p = 0.051), indicating that at least one pair of metacognitive processes differed significantly. Thus, further pairwise comparisons were carried out using the *Wilcoxon Matched-Pairs Signed Ranks Test*.

For **Students in Agricultural Science** learning English, there was a significant difference between perceptions of relevance between the *Planning* and *Evaluating* processes. (See results of the *Wicoxon Matched-Paris Signed Ranks Test* in Appendix 6.1).

There were significant differences between two pairs of the metacognitive processes for **Communication Arts** students in relation to learning English: *Problem-solving* vs *Planning* and *Problem-solving* vs *Evaluating* processes (see Appendix 6.1).

6.1.2 Strategies of the Planning Process

As shown in Table 6.2 below, generally ratings by **students in the given disciplines** on the relevance of *Planning strategies* were only slightly different. Although a greater number of Communication Arts students demonstrated recognition of the relevance of these strategies as

[21] The *Friedman* test is the non-parametric equivalent of a one-way within-subjects analysis of variance.

indicated by mostly positive *Gamma* coefficients,[22] differences between the two groups of students were not statistically significant.

Table 6.2 (STUDENTS) Perceived relevance of *planning* strategies in learning ENGLISH: row percentages.

Planning Strategies		1 Strongly Disagree %	2 Disagree %	3 Neutral %	4 Agree %	5 Strongly Agree %	Measure of Association Gamma[1]	*p*
1. Goal setting	**Ag.Sci**	-	6	47	26	21	0.08	*0.68*
	Comm.Arts	-	*2*	*42*	*42*	*14*		
2. Directing attention selectively	**Ag.Sci**	3	12	32	29	24	0.28	*0.11*
	Comm.Arts	*2*	*2*	*19*	*51*	*26*		
3. Linking with prior knowledge	**Ag.Sci**	3	12	29	35	21	0.17	*0.34*
	Comm.Arts	*2*	*5*	*28*	*40*	*26*		
4. Expecting the encountered problems	**Ag.Sci**	3	15	30	36	15	0.20	*0.26*
	Comm.Arts	*5*	*5*	*28*	*42*	*21*		
5. Intending to ignore distractions/inappropriate thoughts	**Ag.Sci**	6	12	15	35	32	0.14	*0.43*
	Comm.Arts	-	*7*	*14*	*45*	*33*		
6. Preparing to confront obstacles	**Ag.Sci**	-	9	18	50	23	0.04	*0.83*
	Comm.Arts	-	*7*	*19*	*49*	*25*		
7. Predicting outcomes/ answers	**Ag.Sci**	18	23	21	18	20	0.19	*0.25*
	Comm.Arts	*7*	*17*	*36*	*14*	*26*		
8. Predicting the incoming information	**Ag.Sci**	6	21	26	26	21	0.16	*0.34*
	Comm.Arts	*5*	*9*	*28*	*37*	*21*		
9. Choosing strategies for the task	**Ag.Sci**	-	12	29	41	18	-0.03	*0.88*
	Comm.Arts	*5*	*9*	*29*	*38*	*19*		
10. Work ordering	**Ag.Sci**	3	12	24	18	42	0.13	*0.47*
	Comm.Arts	-	*5*	*19*	*37*	*39*		

1 Negative gammas indicate that Ag.Sci students, on the whole, perceived the strategy as more relevant than the Comm.Arts students. Positive *Gammas* indicate that the Comm.Arts students, on the whole, perceived the strategy as more relevant than the Ag.Sci students.

* Significant at or beyond the 0.05 level.

A within-subject comparison using the *Friedman* test showed significant differences for both groups of students[23]. This means that perceived relevance varied significantly across the

[22] Gamma is a PRE (proportional reduction of error) measure of association that is used when both the variables in a cross-tabulation are ordinal level. The individual strategies were rated via a five-point Likert-style scale and thus are considered to be ordinal variables. Subject discipline is a nominal variable, but since it is dichotomous (i.e. has only two categories – Agri.Sci and Comm.Arts), it "can be regarded as being at any level of measurement" and treated "as being at the same level of measurement of the other variable being examined" (de Vaus, 2002). [NB: For these analyses, Agri.Sci was coded as 0 and Comm.Arts coded as 1. Hence, in interpreting the Gamma statistic, a negative coefficient indicates that the Agri.Sci students tended to rate the strategy more highly than the Comm.Arts students. A positive coefficient indicates that the Comm.Arts students tended to rate the strategy more highly than the Agri.Sci students. To be statistically significant, the p value of the Gamma coefficient must be ≤ 0.05.]

ten strategies. Due to the large number of pairwise comparisons that would be required (i.e. 45) and the problem of maintaining an appropriate Type 1 error rate, tests of significance were not used in assessing differences in the ratings of individual *Planning strategies* within each discipline. Instead, the differences were assessed through 'per cent agreement', that is, the sum of the percentages for the *'agree'* and *'strongly agree'* response categories.

Table 6.2 above reveals a tendency towards moderate agreement on the relevance of all ten *Planning strategies* to English listening/reading, according to the ratings of the students in **Agricultural Sciences**. The mean 'percentage agreement' was 56, with strategy no.6 '*preparing to confront obstacles*' being highly recognised as relevant. (This strategy was also seen as relevant to learning MSC by 74 per cent of students in this field (see Table 5.4) which might influence its importance in learning English.) There were moderately low ratings of the relevance of strategy nos.1 *'goal setting',* 7 '*predicting outcomes*' and 8 '*predicting the incoming information*'. In the interviews and the self reports, many Agricultural Science students recorded that they were poor in English and some did not think learning English was useful. This lack of motivation may explain the low score for strategy no. 1 *'goal setting'* in particular. The low rating of strategies 7 and 8, both predicting strategies, also suggests a lack of commitment to learning English.

Students in Communication Arts moderately agreed on the relevance of all *Planning strategies* (the mean percentage was 65) but there was a high level of agreement for strategies 2 *'directing attention selectively',* 5 '*intending to ignore distractions*', 6 '*preparing to confront obstacles*' and 10 '*work ordering'*. The challenge of English tasks might have encouraged many students to recognise the relevance of concentration (nos. 2 & 3), to prepare to guess or look up unknown words/sounds in a dictionary (no.6) and to plan what to do first and then next, i.e., skimming/scanning, listening to chunks of words/listening to connected speech many times (no.10). The focus of both English listening and reading tasks, which demand different cognitive processes to understand unfamiliar language, might leave little room for strategy no.7 '*predicting outcomes',* a strategy which might be useful for making the content clear. Thus, no. 7 was rated as relevant by minority of students (40 per cent).

6.1.3 Strategies of the Monitoring Process

Table 6.3 (below) reveals that the **students in the given disciplines** shared common views on the relevance of *Monitoring strategies* in English learning. The *Gamma* coefficients were all close to zero, and the mean 'percentage agreement' was 63 for Agricultural Sciences compared to 61 for Communication Arts. Although the Agricultural Science students' ratings

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[23] Friedman test: *Agricultural Science students* (χ^2= 20.968, df = 9, p = .013); *Communication Arts students* (χ^2= 29.749, df = 9, p = <.001).

tended to be slightly higher (i.e., six of the *Gamma* coefficients were negative), there was no significant difference found for any strategy.

Results of the within-subject comparison using the *Friedman* test showed that there was a significant difference in the rating of the ten *Monitoring strategies* by the Agricultural Science students[24]. This was not for the Communication Arts students[5].

Table 6.3 (STUDENTS) Perceived relevance of *monitoring* strategies in learning ENGLISH: row percentages.

Monitoring Strategies		1 Strongly Disagree %	2 Disagree %	3 Neutral %	4 Agree %	5 Strongly Agree %	Measure of Association: Gamma[1]	*P*
1. Comprehension check	**Ag.Sci**	-	-	33	46	21	-0.01	*0.94*
	Comm.Arts	*-*	*12*	*26*	*32*	*30*		
2. Checking progress	**Ag.Sci**	3	12	15	36	33	-0.05	*0.75*
	Comm.Arts	*2*	*7*	*28*	*33*	*30*		
3. Detecting weaknesses/obstacles	**Ag.Sci**	3	3	24	27	42	-0.10	*0.56*
	Comm.Arts	*-*	*7*	*30*	*26*	*37*		
4. Seeking related prior knowledge	**Ag.Sci**	-	12	24	33	30	0.02	*0.89*
	Comm.Arts	*2*	*2*	*30*	*37*	*28*		
5. Checking the retrieval of expected information	**Ag.Sci**	-	9	36	30	24	0.13	*0.47*
	Comm.Arts	*-*	*12*	*23*	*35*	*30*		
6. Checking the attention	**Ag.Sci**	-	3	21	24	52	-0.26	*0.15*
	Comm.Arts	*-*	*2*	*30*	*35*	*33*		
7. Checking appropriateness of the strategy used	**Ag.Sci**	-	18	39	21	21	0.09	*0.58*
	Comm.Arts	*-*	*24*	*17*	*38*	*21*		
8. Checking importance of the information	**Ag.Sci**	6	3	15	49	27	-0.05	*0.77*
	Comm.Arts	*2*	*12*	*19*	*37*	*30*		
9. Checking the linkage to other subjects	**Ag.Sci**	3	15	24	36	21	-0.05	*0.77*
	Comm.Arts	*5*	*12*	*37*	*21*	*26*		
10. Checking correctness of the predictions/ answers	**Ag.Sci**	12	24	15	27	21	0.14	*0.40*
	Comm.Arts	*2*	*21*	*30*	*19*	*28*		

1 Negative gammas indicate that Ag.Sci students, on the whole, perceived the strategy as more relevant than the Comm.Arts students. Positive gammas indicate that the Comm.Arts students, on the whole, perceived the strategy as more relevant than the Ag.Sci students.

* Significant at or beyond the 0.05 level.

As shown in Table 6.3, generally the **Agricultural Science students** agreed that *Monitoring strategies* were relevant to learning English. However, there were relatively low percentages of agreement for strategy nos. 7 and 10 (42 per cent and 48 per cent respectively). As strategy no. 7 *'checking the appropriateness of the strategy being used'* is a rather high-level metacognitive skill, many students may not have had sufficient experience to prove its relevance in this context. Low ratings on strategy 10 *'checking the predictions'* might relate to the low ratings on both predicting strategies of *Planning* as seen in the previous section (6.1.2).

Communication Arts students generally agreed on the relevance of *Monitoring strategies* (see Table 6.3 above) except for strategy nos. 9 '*checking linkage to other subjects'* and 10 '*checking the correctness of predictions*'. Compared with their perceived relevance of the strategies in learning the MSC, fewer students agreed that strategy no. 9 was relevant to learning English (57 per cent, in Table 5.5, as opposed to 47 per cent), but marginally more students thought strategy no. 10 was relevant (32 per cent, in Table 5.5, as opposed to 47 per cent).

6.1.4 Strategies of the Problem-solving Process

As seen in Table 6.4 below, **students in the given disciplines** showed a slight divergence. Relatively low numbers of Agricultural Science students rated *Problem-solving strategies* as relevant, compared with students from Communication Arts. There was a significant difference between the two groups of students in strategy no. 8 *'making new guesses'*. More Communication Arts students saw this strategy as relevant to learning English. Once again, this might be indicative of more commitment to learning English by the Communication Arts students.

Results of the within-subject comparison using the *Friedman* test, showed that for both Agricultural Sciences and Communication Arts, perceived relevance variedsignificantly across the *Problem-solving strategies*[25]. In the **Agricultural Sciences**, only half of students or more saw six out of the Ten Problem-solving strategies as relevant to English listening/reading tasks. The mean 'per cent agreement' on the recognition of relevance here was 47. Strategy nos. 1, 5, 6, 7, 9 and 10 were perceived as relevant by more than 50 per cent of students, with strategy no. 10 '*self-encouragement*' being seen as the most relevant in dealing with English language learning. Fewer students saw strategy nos. 2, 3, 4 and 8 (percent agreement 29, 27, 45 and 38, respectively) as relevant for listening/reading tasks in English. The negative attitudes towards learning English and problem-solving, as evident in the self reports on learning the English, might have caused many students to fail to see the relevance of these strategies in learning English.

[24] Friedman test: *Agricultural Science students* (χ^2= 26.368, df = 9, p =.002); *Communication Arts students* (χ^2= 10.810, df = 9, p =.289).
[25] Friedman test: *Agricultural Science students* (χ^2= 30.855, df = 9, p <.001); *Communication Arts students* (χ^2= 57.848, df = 9, p <.001).

Table 6.4 (STUDENTS) Perceived relevance of *problem-solving* strategies in learning ENGLISH: row percentages.

Problem-Solving Strategies		1 Strongly Disagree %	2 Disagree %	3 Neutral %	4 Agree %	5 Strongly Agree %	Measure of Association Gamma[1]	p
1. Revising the plan	**Ag.Sci**	6	15	23	38	18	0.24	*0.16*
	Comm.Arts	-	*12*	*21*	*39*	*28*		
2. Accessing various resources	**Ag.Sci**	12	29	29	15	15	0.15	*0.35*
	Comm.Arts	*9*	*19*	*35*	*23*	*14*		
3. Ignoring problems	**Ag.Sci**	15	24	33	18	9	-0.17	*0.30*
	Comm.Arts	*24*	*31*	*19*	*19*	*7*		
4. Asking for clarification	**Ag.Sci**	9	33	12	24	21	0.02	*0.88*
	Comm.Arts	*2*	*26*	*43*	*10*	*19*		
5. Linking with prior knowledge	**Ag.Sci**	-	12	35	38	15	0.16	*0.37*
	Comm.Arts	-	*9*	*30*	*37*	*23*		
6. Seeking peer support	**Ag.Sci**	3	9	33	24	30	0.08	*0.64*
	Comm.Arts	-	*7*	*28*	*39*	*26*		
7. Trying alternatives	**Ag.Sci**	6	23	15	41	15	0.11	*0.53*
	Comm.Arts	*2*	*12*	*32*	*34*	*20*		
8. Making new guesses	**Ag.Sci**	21	23	18	21	17	0.31	*0.05**
	Comm.Arts	-	*21*	*35*	*16*	*28*		
9. Logic reasoning	**Ag.Sci**	9	23	15	35	18	-0.05	*0.78*
	Comm.Arts	*9*	*19*	*26*	*32*	*14*		
10. Self-encouragement	**Ag.Sci**	-	12	27	21	39	0.26	*0.15*
	Comm.Arts	-	*7*	*14*	*28*	*51*		

1 Negative gammas indicate that Ag.Sci students, on the whole, perceived the strategy as more relevant than the Comm.Arts students. Positive gammas indicate that the Comm.Arts students, on the whole, perceived the strategy as more relevant than the Ag.Sci students.

* Significant at or beyond the 0.05 level.

A somewhat higher proportion of **students in Communication Arts** saw *Problem-solving strategies* as relevant in English listening/reading tasks. The mean 'percent agreement' was 51. These students, as by Agricultural Science students, identified the same strategies as relevant, e.g., nos. 1, 5, 6, 7 and 10. Communication Arts students thought strategy nos. 2 '*accessing various resources'*, 3 '*ignoring problems'*, 4 '*asking for clarification',* 8 *'making new guesses'* and 9 *'logic reasoning'* were less relevant when tackling listening or reading incomprehension. Fewer Communication Arts students rated strategy nos. 2 and 4 in particular as more relevant for English than for the MSC. This might reflect insufficient opportunities to apply these strategies when learning English in Thailand. This is particularly the case for listening when there is no time to look up words in a dictionary/glossary (no.2), *ask for clarification* or *make new guesses*. This might also explain why higher ratings for *ignoring [a] problem* (no. 3) and *do logic reasoning* (no. 9) were greater than for the MSC. Interestingly, however, these students were less likely to perceive the relevance of strategy no. 8 *'making new guesses'* in learning English than in learning the MSC.

6.1.5 Strategies of the Evaluating Process

Table 6.5 (below) reveals that **students in the two disciplines** rated the relevance of *Evaluating strategies* similarly. The mean percentages of agreement were 55 for Agricultural Science students and 58 for Communication Arts students. They differed significantly only in strategy no. 5 *'seeking other suitable strategy'*, with more Communication Arts students seeing its relevance. The within group tests (*Friedman*) showed that perceived relevance varied significantly across the ten *Evaluating strategies* for the Communication Arts students, but not for the Agricultural Science students[26].

Table 6.5 (STUDENTS) Perceived relevance of *evaluating* strategies in learning ENGLISH: row percentages

Evaluating Strategies		1 Strongly Disagree %	2 Disagree %	3 Neutral %	4 Agree %	5 Strongly Agree %	Measure of Association Gamma[1]	*p*
1. Judging that the goal has been met	**Ag.Sci**	3	15	18	38	26	0.11	*0.54*
	Comm.Arts	*7*	*5*	*16*	*42*	*30*		
2. Strategy suitability & effectiveness	**Ag.Sci**	6	15	26	32	21	0.24	*0.15*
	Comm.Arts	*5*	*2*	*28*	*35*	*30*		
3. Within subject applicability	**Ag.Sci**	6	18	23	35	18	0.11	*0.51*
	Comm.Arts	*2*	*8*	*38*	*30*	*22*		
4. Other areas applicability	**Ag.Sci**	6	9	26	32	27	0.09	*0.60*
	Comm.Arts	*2*	*12*	*26*	*25*	*35*		
5. Seeking other suitable strategy	**Ag.Sci**	15	12	35	23	15	0.37	*0.02**
	Comm.Arts	*2*	*7*	*30*	*35*	*26*		
6. Summarizing lesson	**Ag.Sci**	3	12	23	35	27	-0.09	*0.62*
	Comm.Arts	*5*	*12*	*25*	*37*	*21*		
7. Judging how much learned	**Ag.Sci**	3	12	41	21	23	0.17	*0.33*
	Comm.Arts	*2*	*14*	*19*	*38*	*26*		
8. Assessing correctness of the predictions	**Ag.Sci**	3	24	21	29	23	-0.13	*0.44*
	Comm.Arts	*7*	*23*	*23*	*30*	*16*		
9. Comparing new knowledge with known knowledge	**Ag.Sci**	-	21	18	29	32	-0.12	*0.48*
	Comm.Arts	*2*	*12*	*30*	*37*	*19*		
10. Judging worthiness of learning	**Ag.Sci**	12	6	18	29	35	0.00	*0.99*
	Comm.Arts	*2*	*7*	*23*	*40*	*28*		

1 Negative gammas indicate that Ag.Sci students, on the whole, perceived the strategy as more relevant than the Comm.Arts students. Positive gammas indicate that the Comm.Arts students, on the whole, perceived the strategy as more relevant than the Ag.Sci students.

* Significant at or beyond the 0.05 level.

[26] Friedman test: *Agricultural Science students* (χ^2= 14.806, df = 9, p =.096); *Communication Arts students* (χ^2= 19.168, df = 9, p =.024).

Overall, a moderately high number of **students in Agricultural Sciences** agreed on the relevance of most of the *Evaluating strategies* for English listening/reading tasks (see Table 6.5). Strategies 5 *'seeking other suitable strategy'* and 7 *'judging how much learned'* were seen as the least relevant. Both strategies were also seen as less relevant in learning the MSC. Strategy nos. 5 and 7 would require some sort of reflection on the suitability of what one is doing and how effective it is for learning, which is a rather sophisticated skill.

Generally, more **students in Communication Arts** saw the relevance of *Evaluating strategies* to the English learning than Agricultural Science students, with the exception of strategy no. 8 *assessing the correctness of predictions*. Communication Arts also differed significantly from Agricultural Science students on the relevance of strategy no. 5 *'seeking other suitable strategy'*. This was also the case for learning the MSC where more Communication Arts students saw *Evaluating strategies* as relevant than Agricultural Science students. It is possible that these students, as the interviews reveal, have done quite a lot of evaluating when practising their performances (e.g., writing scripts, producing advertisement spots, news reading) so they are more able to self evaluate or see the relevance in doing so.

6.2 USE BY STUDENTS

6.2.1 Overall Metacognitive Process

Table 6.6 (below) shows that a moderate number of **students in these two disciplines** used metacognitive processes in English listening or reading tasks. A comparison between these two groups of students using the *Mann-Whitney U* test provided a significant difference in the use of the *Planning* process, with the Communication Arts students tending to make greater overall use of *Planning strategies* than their Agricultural Science peers.

Table 6.6 Use of metacognitive processes in learning ENGLISH

	Median		**Range[1]**		**N**		**Mann-Whitney *U* Test**			
							Mean Rank		**Test Statistics**	
	Ag.Sci	***Comm. Arts***	**Ag.Sci**	***Comm. Arts***	**Ag.Sci**	***Comm. Arts***	**Ag.Sci**	***Comm. Arts***	***Z***	***p***
Planning	31.0	*35.0*	25	*29*	31	*38*	28.8	40.1	-2.34	*0.02**
Monitoring	33.0	*35.5*	28	*24*	33	*40*	34.5	*39.0*	-0.90	*0.37*
Problem-Solving	33.0	*34.0*	27	*26*	29	*40*	32.5	*36.8*	-0.89	*0.37*
Evaluating	34.5	*35.0*	36	*26*	34	*40*	33.9	*40.6*	-1.34	*0.18*

1 Maximum range = 40
* Significant at or beyond the 0.05 level

Taking **Agricultural Sciences** on its own, students reported using the *Evaluating* process the most followed by *Monitoring* and *Problem-solving,* with the *Planning* process being used the least. However the within subject group comparison using the *Friedman* test*,* showed that there was no significant difference within this pattern of use[27].

The median scores for the **Communication Arts** were very similar (35, 35, 34 and 35), and the *Friedman* test confirmed that there was no significant difference in the use of these processes within the group[28].

6.2.2 Strategies of the Planning Process

As is evident in Table 6.7 (below), there were significant differences between the two disciplines in their use of four *Planning strategies* in learning English. These included strategy nos. 3 *'linking with prior knowledge'*, 4 *'expecting the encountered problem'*, 7 *'predicting outcomes'* and 8 *'work ordering'*— all of which were more often used by the Communication Arts students. This result was also reflected in statistical significance for the whole process (see section 6.2.1 and Table 6.6) and in the overall mean percentages of frequent use[29], which were 38 and 53 for Agricultural Sciences and Communication Arts, respectively.

The within-subject comparisons using the *Friedman* test of ranked percentages showed significant differences within the pattern of ratings for both groups of students[30]. In the **Agricultural Sciences**, the highest percentages of frequent use were found for nos. 5 *'intending to ignore distractions'* (62 per cent), 6 *'preparing to confront obstacles'* (62 per cent) and 10 *'work ordering*'; (50 per cent) while all other strategies were frequently used by less than 50 per cent of students. Many of these students, who perceived themselves as poor in English, might not have had adequate prior knowledge to support the use of strategies 1, 3, 4, 7, 8 and 9.

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[27] Friedman test: χ^2= 4.663, df = 3, p = 0.198

[28] Friedman test: χ^2= 1.038, df = 3, p = 0.792

[29] Percentage of frequent use refers to the percentage of students who said they 'often use' or 'always use' the strategy.

[30] Friedman test: *Agricultural Science students* (χ^2= 48.750, df = 9, p =<.001); *Communication Arts students* (χ^2= 20.963, df = 9, p = .013).

Table 6.7 (STUDENTS) Use of *planning* strategies in learning ENGLISH: row percentages

Planning Strategies		1 Never Use %	2 Rarely Use %	3 Sometimes Use %	4 Often Use %	5 Always Use %	Measure of Association Gamma[1]	*p*
1. Goal setting	**Ag.Sci**	-	15	56	26	3	0.16	*0.41*
	Comm.Arts	*5*	*7*	*51*	*28*	*9*		
2. Directing attention selectively	**Ag.Sci**	3	21	35	35	6	0.13	*0.46*
	Comm.Arts	*2*	*12*	*44*	*28*	*14*		
3. Linking with prior knowledge	**Ag.Sci**	6	21	46	18	9	0.44	*0.01**
	Comm.Arts	*5*	*5*	*35*	*40*	*16*		
4. Expecting the encountered problems	**Ag.Sci**	6	24	39	21	9	0.45	*<0.01**
	Comm.Arts	*7*	*2*	*33*	*31*	*26*		
5. Intending to ignore distractions/inappropriate thoughts	**Ag.Sci**	6	15	18	38	23	0.07	*0.70*
	Comm.Arts	-	*10*	*34*	*27*	*29*		
6. Preparing to confront obstacles	**Ag.Sci**	3	6	29	44	18	0.10	*0.56*
	Comm.Arts	*2*	*7*	*26*	*39*	*26*		
7. Predicting outcomes/ answers	**Ag.Sci**	26	21	29	15	9	0.43	*<0.01**
	Comm.Arts	5	26	17	24	28		
8. Predicting the incoming information	**Ag.Sci**	9	32	29	23	6	0.38	*0.02**
	Comm.Arts	*5*	*16*	*28*	*33*	*19*		
9. Choosing strategies for the task	**Ag.Sci**	3	18	49	21	9	0.32	*0.06*
	Comm.Arts	*2*	*12*	*31*	*41*	*14*		
10. Work ordering	**Ag.Sci**	3	9	38	21	29	0.14	*0.43*
	Comm.Arts	*2*	*2*	*33*	*35*	*28*		

1 Negative gammas indicate that Ag.Sci students, on the whole, used the strategy more than the Comm.Arts students. Positive gammas indicate that the Comm.Arts students, on the whole, used the strategy more than the Ag.Sci students.

* Significant at or beyond the 0.05 level

In **Communication Arts,** strategy no.6 '*preparing to confront obstacles'* (65 per cent) was the most frequently used while the least used strategies were nos. 1 *'goal setting'* (37 per cent) and 2 *'directing attention selectively'* (42 per cent). As with the Agricultural Science students, the frequent use of strategy no. 6 might show that English listening/reading is challenging. Conversely, the nature of the learning tasks either in learning the MSC or English might not encourage a *'goal setting'* strategy. This confirms the findings in the interviews where the strategy was included into teaching Communication Arts but none of the students mentioned. One instructor made further comments that his students needed to find their interest and set their own goals. Moreover, the negative attitudes that many students in Communication Arts came up with in their self-reports may prevent these students from using the *'directing attention selectively'* strategy (no. 2).

6.2.3 Strategies of the Monitoring Process

As seen on Table 6.8 below, ratings on the use of *Monitoring strategies* between students in the two groups diverged significantly only in strategy no. 4 *'seeking related prior knowledge'*. The positive *Gamma* result showed that more students in Communication Arts used this strategy.

Table 6.8 (STUDENTS) Use of *monitoring* strategies in learning ENGLISH: row percentages

Monitoring Strategies		1 Never Use %	2 Rarely Use %	3 Sometimes Use %	4 Often Use %	5 Always Use %	Measure of Association: Gamma[1]	p
1. Comprehension check	Ag.Sci	-	21	36	30	12	0.21	0.21
	Comm.Arts	-	14	35	26	25		
2. Checking progress	Ag.Sci	3	12	27	39	18	0.06	0.71
	Comm.Arts	2	16	23	30	28		
3. Detecting weaknesses/obstacles	Ag.Sci	3	3	21	39	33	-0.11	0.52
	Comm.Arts	-	7	33	28	32		
4. Seeking related prior knowledge	Ag.Sci	-	27	36	21	15	0.43	0.01*
	Comm.Arts	2	5	29	36	29		
5. Checking the retrieval of expected information	Ag.Sci	3	9	46	21	21	0.02	0.93
	Comm.Arts	-	19	33	24	24		
6. Checking the attention	Ag.Sci	-	21	21	21	36	-0.09	0.62
	Comm.Arts	-	12	35	32	21		
7. Checking appropriateness of the strategy used	Ag.Sci	3	21	30	36	9	0.17	0.33
	Comm.Arts	-	21	26	31	21		
8. Checking importance of the information	Ag.Sci	6	18	33	27	15	0.24	0.14
	Comm.Arts	2	14	28	28	28		
9. Checking the linkage to other subjects	Ag.Sci	6	24	21	36	12	0.08	0.61
	Comm.Arts	9	14	30	23	23		
10. Checking correctness of the predictions/answers	Ag.Sci	15	27	30	9	18	0.25	0.13
	Comm.Arts	7	23	23	23	23		

1 Negative gammas indicate that Ag.Sci students, on the whole, used the strategy more than the Comm.Arts students. Positive gammas indicate that the Comm.Arts students, on the whole, used the strategy more than the Ag.Sci students.

* Significant at or beyond the 0.05 level

Within the **Agricultural Sciences**, the overall mean percentage of frequent use was 47. The *Friedman* test result shows that the level of use does vary across the ten *Monitoring strategies*[31]. The most used strategy was no. 3 *'detecting weaknesses/obstacles'* (73 per cent), showing that learning English was challenging for these students and caused them to regularly check their comprehension and realise the weaknesses or obstacles. This is consistent with

[31] Friedman test: *Agricultural Science* students ($\chi2$= 27.461, df = 9, p =.001).

results from the self-reports where all volunteers showed apprehension about their lack of English skills and comprehension problem. Strategy no. 10 '*checking the correctness of predictions*' (27 per cent) was the least likely to be used by the Agricultural Science students. These students might not see a role for predicting in English as in the MSC. Five other strategies were also used often or always by less than 50 per cent of students. Interestingly these included no. 1 *'comprehension check'*. Although this strategy has quite different implications for learning English than learning MSC, nonetheless we would expect it to be frequently used in reading and listening to English, but this is not really the case. It might be because their focus was on the weaknesses or obstacles and overlooked the checking activities.

In **Communication Arts**, the overall mean percentage of frequent use for the *Monitoring strategies* was relatively high at 58. Variation in the ratings of the ten strategies by the Communication Arts students was not statistically significant[32]. The most commonly used strategy (64 per cent) was no. 4 *'seeking related prior knowledge'*. The prior knowledge some of these students verbalised in the think-aloud protocols included jargon, familiar words, grammatical knowledge and knowledge about reading or listening topic. The least used strategies were nos. 9 *'checking the linkage to other subjects'* (47 per cent), 10 *'checking the predictions'* (47 per cent) and 5 *'checking the retrieval of the expected information'* (48 per cent). This result is consistent with learning the MSC, where no. 10 was also the least used strategy. These results might indicate that strategies nos. 9 and 10 are at a high cognitive level (see the discussion on levels of cognitive processing in section 2.3.3) and that many students have not been able to use them independently yet.

6.2.4 Strategies of the Problem-solving Process

As is evident in Table 6.9 below, there were significant differences between the **Agricultural Science and Communication Arts students** in their use of two *Problem-solving strategies*. The positive *Gamma* results indicate that significantly more Communication Arts recorded use of strategy no. 1 *'revising the plan'* and no. 10 *'self-encouragement'*. Nonetheless, this divergence did not result in a significant for the total process (see *Mann-Whitney* result in Table 6.6 earlier).

Generally, low numbers of **Agricultural Science students** used *Problem-solving strategies* in dealing with English listening/reading tasks, as reflected in the relatively low mean 'percentage frequent use' of 43. The *Friedman* test result shows that level of use does vary significantly across the ten strategies. Strategy nos. 6 *'seeking peer support'* (61 per cent), 10 *'self-encouragement'* (55 per cent) and 8 *'making new guesses'* (50 per cent) were being most commonly used. The least frequently used strategy was no. 3 *'ignoring problems'* (30 per cent).

Table 6.9 (STUDENTS) Use of problem-solving strategies in learning ENGLISH: row percentages.

Problem-Solving Strategies		1 Never Use %	2 Rarely Use %	3 Sometimes Use %	4 Often Use %	5 Always Use %	Measure of Association Gamma[1]	p
1. Revising the plan	**Ag.Sci**	9	21	23	38	9	0.39	*0.01**
	Comm.Arts	-	*14*	*21*	*37*	*28*		
2. Accessing various resources	**Ag.Sci**	15	24	21	30	9	0.10	*0.56*
	Comm.Arts	*9*	*19*	*33*	*30*	*9*		
3. Ignoring problems	**Ag.Sci**	18	21	30	21	9	-0.20	*0.22*
	Comm.Arts	*24*	*29*	*31*	*7*	*9*		
4. Asking for clarification	**Ag.Sci**	15	36	12	21	15	0.09	*0.58*
	Comm.Arts	*7*	*28*	*39*	*14*	*12*		
5. Linking with prior knowledge	**Ag.Sci**	-	24	38	29	9	0.29	*0.09*
	Comm.Arts	-	*14*	*30*	*40*	*16*		
6. Seeking peer support	**Ag.Sci**	3	12	24	30	30	-0.01	*0.94*
	Comm.Arts	-	*7*	*30*	*42*	*21*		
7. Trying alternatives	**Ag.Sci**	12	24	23	23	18	0.23	*0.18*
	Comm.Arts	2	12	29	44	12		
8. Making new guesses	**Ag.Sci**	21	18	12	29	21	0.16	*0.33*
	Comm.Arts	*2*	*23*	*26*	*23*	*26*		
9. Logic reasoning	**Ag.Sci**	12	26	29	21	12	0.10	*0.55*
	Comm.Arts	*12*	*19*	*31*	*24*	*14*		
10. Self-encouragement	**Ag.Sci**	3	21	21	18	36	0.34	*0.05**
	Comm.Arts	-	*9*	*12*	*28*	*51*		

1 Negative gammas indicate that Ag.Sci students, on the whole, used the strategy more than the Comm.Arts students. Positive gammas indicate that the Comm.Arts students, on the whole, used the strategy more than the Ag.Sci students.

* Significant at or beyond the 0.05 level

Compared with the other metacognitive processes, fewer students in **Communication Arts** reported using *Problem-solving strategies* in tackling English listening/reading tasks. Once again, the mean percentage of frequent use was only 49. The *Friedman* test result showed that the level of use by Communication Arts students varied significantly across the ten strategies. Many students in this field perceived themselves as poor at English, so not surprisingly strategy no. 10 *'self-encouragement'* (79 per cent) was the most commonly used. Very few students (17 per cent) reported using strategy 3 *'ignoring problems'* which suggests a high degree of application to their work and this is further supported by the relatively frequent use of strategies 1 (65 per cent), 5 (56 per cent), 6 (63 per cent) and 7 (56 percent).

[32] Friedman test: *Communication Arts students* ((χ^2= 15.443, df = 9, p =.079).

6.2.5 *Strategies of the Evaluating Process*

Table 6.10 shows that the Communication Arts students tended to make more frequent use of the *Evaluating strategies* in English listening/reading tasks than their Agricultural Science peers. However, only the difference in strategy no. 2 *'judging strategy suitability and effectiveness'* achieved statistical significance. Nonetheless, this did not yield significant difference between the groups for the entire *Evaluating* process (see Table 6.6 earlier).

Table 6.10 (STUDENTS) Use of *evaluating* strategies in learning ENGLISH: row percentages

Evaluating Strategies		1 Never Use %	2 Rarely Use %	3 Sometimes Use %	4 Often Use %	5 Always Use %	Measure of Association Gamma[1]	*p*
1. Judging that the goal has been met	Ag.Sci	6	15	35	29	15	0.31	*0.06*
	Comm.Arts	*9*	*5*	*19*	*39*	*28*		
2. Strategy suitability & effectiveness	Ag.Sci	6	24	26	32	12	0.34	*0.04**
	Comm.Arts	*5*	*7*	*21*	*51*	*16*		
3. Within subject applicability	Ag.Sci	6	15	47	21	12	0.28	*0.10*
	Comm.Arts	*3*	*10*	*35*	*37*	*15*		
4. Other areas applicability	Ag.Sci	6	12	35	35	12	0.22	*0.20*
	Comm.Arts	-	*14*	*28*	*35*	*23*		
5. Seeking other suitable strategy	Ag.Sci	18	15	29	21	18	0.23	*0.16*
	Comm.Arts	*5*	*9*	*37*	*30*	*19*		
6. Summarizing lesson	Ag.Sci	6	12	35	29	18	0.09	*0.61*
	Comm.Arts	*5*	*9*	*33*	*35*	*19*		
7. Judging how much learned	Ag.Sci	9	9	29	38	15	0.06	*0.74*
	Comm.Arts	7	9	29	36	19		
8. Assessing correctness of the predictions	Ag.Sci	3	24	44	12	18	0.02	*0.91*
	Comm.Arts	*7*	*23*	*26*	*37*	*7*		
9. Comparing new knowledge with known knowledge	Ag.Sci	3	21	20	38	18	0.08	*0.66*
	Comm.Arts	*2*	*9*	*30*	*42*	*16*		
10. Judging worthiness of learning	Ag.Sci	12	9	32	24	23	0.24	*0.16*
	Comm.Arts	*2*	*9*	*21*	*42*	*26*		

1 Negative gammas indicate that Ag.Sci students, on the whole, used the strategy more than the Comm.Arts students. Positive gammas indicate that the Comm.Arts students, on the whole, used the strategy more than the Ag.Sci students.

* Significant at or beyond the 0.05 level

Overall a relatively low number of **Agricultural Science** students used *Evaluating strategies* (mean percentage equals 44), and there was no significant difference in the pattern of ratings[33] for English listening/ reading tasks. Strategy no. 9 *'comparing new knowledge with known knowledge'* was the most commonly used (56 per cent). The result for no. 9 was similar

[33] Friedman test: Agricultural Science students ($\chi 2$= 7.738, df = 9, p =.561).

to that for learning MSC (59 per cent) and might indicate that these students are able to transfer some strategies across contexts. Only 29 per cent of Agricultural Science students used strategy no. 8 *'assessing correctness of the predictions'*, the lowest rated strategy. Given the students perceived themselves as low level of English (see section 3.1.1), it is most likely that they relied heavily on instructors to tell them if they were correct or not.

Communication Arts students recorded a moderate use of all *Evaluating strategies* in learning English. The mean percentage of ratings on frequent use was 57. The *Friedman* test result showed that level of use varied significantly across the ten strategies[34]. The most commonly used strategies were nos. 1, 2 and 10 (all 67 per cent). These strategies might be indicative of the independent learning that students in this field have had the opportunity to develop. The least likely strategy to be used was strategy no. 8 *'assessing correctness of the predictions'* (44 per cent). Again, low ratings for the relevance of this strategy might be at play here (see Table 6.5).

6.3 RELEVANCE TO STUDENTS AND USE BY STUDENTS

6.3.1 Overall Metacognitive Process

The *Spearman's Rank Order Correlations (rho)* test was used in comparing the perceived relevance of the metacognitive processes and their actual use by students. *Spearman's Rank Order Correlations (rho)* test is an appropriate measure to use with ordinal data that has a large number of categories (de Vaus, 2002). As seen in Table 6.11, the results of *Spearman's Rank Order Correlations (rho)*, as one might have expected, show a significant relationship between the ratings on relevance and use of *Metacognitive processes*.

Table 6.11 (STUDENTS) Correlation between perceived relevance and use of metacognitive processes: *Spearman's Rank Order Correlations (rho)*.

	Ag. Sci		Comm. Arts	
	rho[1]	p^2	rho[1]	p^2
Planning	**0.66**	***<0.01****	**0.91**	***<0.01****
Monitoring	**0.67**	***<0.01****	**0.90**	***<0.01****
Problem-Solving	**0.75**	***<0.01****	**0.92**	***<0.01****
Evaluating	**0.75**	***<0.01****	**0.91**	***<0.01****

1 Spearman's rho coefficient
2 Significance - two-tailed
* Significant beyond the 0.05 level

[34] Friedman test: *Communication Arts students* (χ^2= 26.353, df = 9, p =.002).

The **students in Agricultural Science** showed a substantial positive relationship between the perceptions of relevance and their use of *Problem-solving* and *Evaluating* processes. There were moderate positive relationships between perceived relevance and use in *Planning* and *Monitoring* processes.

The **Communication Arts students** showed a near perfect positive relationship for every process**.**

In comparing the perceived relevance of a particular strategy with its use by students, the *Kendall's tau-b measure of association* was used. Although other ordinal measures of association could have been used (e.g. *Gamma, Spearman's Rank Order Correlations (rho)* and *Kendall's tau-c*), *Kendall's tau-b* was chosen because it is particularly suitable for square tables where both variables have a relatively small number of categories (i.e. in this case, five each). Details are presented in the following sections.

6.3.2 Strategies the Planning Process

As shown in Table 6.12 below, the students in **the two disciplines** showed a moderate to strong correlation between perceived relevance of *Planning strategies* and their actual use. Most results were statistically significant at or beyond the 0.05 level. Especially strong relationships were found for strategy nos. 5, 7 and 10. However, there were also some anomalies in that while Communication Arts students' use of all strategies corresponded to their perceptions of the relevance, the use of strategy no. 1 by the students in Agricultural Science did not relate to their perceived relevance. Another mismatch was found in the strength of relationship, whereby students in Communication Arts showed a stronger relationship for strategies nos. 3, 7, 8 and 9 and Agricultural Science students showed a stronger relationship for strategy no. 4.

For students in the **Agricultural Sciences**, the strongest correlations were between relevance and use for *Planning strategy* nos. 4, 5, 7, 8 and 10. There was a weak association between perceived relevance and use for strategy no. 2 *'directing attention selectively'*. A relatively low positive relationship (*tau-b*>0.30) was found for strategy nos. 3 *'linking with prior knowledge'* and 9 *'choosing strategies for the task'*. Interestingly, there was no relationship for strategy no. 1 *'goal setting'*. This result concurs with Vogely (1995) who found that although learners have knowledge about learning to listen to another language, they do not necessarily use this knowledge effectively. In the Agricultural Sciences, although instructors reported that metacognitive processes such as planning were included in teaching all major subjects, their students still lacked the strategies. Some remarked that they had to do planning for their students and also to help them solve a problem. This and the negative attitudes towards learning English revealed in the students' self-reports might underlie the low ratings on its relevance and use of strategy no. 1.

Table 6.12 (STUDENTS) Association between the perceived relevance of planning strategies and the use of planning strategies in learning ENGLISH: Kendall's tau-b

	Planning Strategies	Ag. Sci. Students1		Comm. Arts Students2	
		tau-b[3]	*p*	tau-b[3]	*p*
1	Goal setting	0.09	*0.60*	0.58	*<0.01**
2	Directing attention selectively	0.29	*0.05**	0.63	*<0.01**
3	Linking with prior knowledge	0.48	*<0.01**	0.74	*<0.01**
4	Expecting the encountered problem	0.60	*<0.01**	0.46	*<0.01**
5	ignore distractions Intending to	0.64	*<0.01**	0.67	*<0.01**
6	Preparing to confront obstacles	0.53	*<0.01**	0.56	*<0.01**
7	Predicting outcomes	0.70	*<0.01**	0.81	*<0.01**
8	Predicting the incoming information	0.62	*<0.01**	0.78	*<0.01**
9	Choosing strategies for the task	0.35	*0.05**	0.69	*<0.01**
10	Work ordering	0.64	*<0.01**	0.67	*<0.01**

1 N = 34
2 N = 43
3 Kendall's tau-b coefficient
* Significant at or beyond the 0.05 level

Communication Arts students showed a relatively strong relationship for most of the Planning strategies except nos. 1, 4 and 6. When compared with learning the MSC, only the relationship for strategy no. 2 is consistent (see also Table 5.2). The strong relationship between relevance and use of so many *Planning strategies* might be affected by the tasks. Unlike their Agricultural Science counterparts, Communication Arts students found that learning English was challenging and this may have encouraged the recognition of strategy relevance and subsequent use.

6.3.3 Strategies of the Monitoring Process

As shown on Table 6.13 (below), for **students in both disciplines,** the relationships between use of each *Monitoring strategy* and perceptions of relevance were statistically significant. Very similarly strengths of relationships were found for both groups of the students for strategy nos. 2 *'checking progress'*, 5 *'checking the retrieval of expected information'*, 6 *'checking the attention'*, 8 *'checking importance of the information'* and 10 *'checking correctness of the predictions'*. These associations, except for strategy no. 5, were also similar for both groups of students in learning their MSC (see also Table 5.23). It might be that students have developed the ability to perceive which strategies are relevant and to use them accordingly.

Table 6.13 (STUDENTS) Association between the perceived relevance of monitoring strategies and the use of monitoring strategies in learning ENGLISH: Kendall's tau-b

	Monitoring Strategies	Ag. Sci. Students1		Comm. Arts Students2	
		tau-b[3]	*p*	tau-b[3]	*p*
1	hension checkCompre	0.54	*<0.01**	0.77	*<0.01**
2	Checking progress	0.72	*<0.01**	0.76	*<0.01**
3	/Detecting weaknesses obstacles	0.58	*<0.01**	0.81	*<0.01**
4	Seeking related prior knowledge	0.38	*0.01**	0.71	*<0.01**
5	Checking the retrieval of expected information	0.64	*<0.01**	0.66	*<0.01**
6	Checking the attention	0.62	*<0.01**	0.66	*<0.01**
7	Checking appropriateness of the strategy being used	0.54	*<0.01**	0.77	*<0.01**
8	Checking importance of the information	0.58	*<0.01**	0.55	*<0.01**
9	Checking the linkage to other bjectssu	0.53	*<0.01**	0.74	*<0.01**
10.	Checking the predictions/answers	0.76	*<0.01**	0.84	*<0.01**

1 N = 33
2 N = 43
3 Kendall's tau-b coefficient
* Significant at or beyond the 0.05 level

Some mismatch between the two groups of students was also found. Considerably stronger associations were evident among Communication Arts students for strategy nos. 1 *'comprehension check'*, 3 *'detecting weakness/obstacles'*, 4 *'seeking related prior knowledge'*, 7 *'checking appropriateness of the strategy being used'* and 9 *'checking the linkage to other subjects'*. The most marked difference between the two groups of students was with strategy no. 4*'seeking related prior knowledge'*. This is consistent with ratings for the MSC (see Table 5.23). It is possible that the more instructive tasks of Agricultural Science hamper students' independent learning such as *seeking prior knowledge*. Insufficient practice in independent learning might obstruct Agricultural Science students from transferring strategies across contexts or perhaps their English is so poor that they have no prior knowledge to refer to.

6.3.4 Strategies of the Problem-solving Process

As is evident in Table 6.14, there were moderate to strong significant associations between perceptions of relevance and use of *Problem-solving strategies* for **both groups of students.** Overall, however, the associations between perceived relevance and use were stronger for the Communication Arts students.

Table 6.14 (STUDENTS) Association between the perceived relevance of problem-solving strategies and the use of problem-solving strategies in learning ENGLISH: Kendall's tau-b

	Problem-Solving Strategies	**Ag. Sci.1**		**Comm. Arts2**	
		tau-b3	***p***	**tau-b3**	***p***
1.	Revising the plan	0.62	*<0.01**	0.65	*<0.01**
2.	Accessing various resources	0.72	*<0.01**	0.79	*<0.01**
3.	Ignoring problems	0.70	*<0.01**	0.74	*<0.01**
4.	Asking for clarification	0.67	*<0.01**	0.61	*<0.01**
5.	Linking with prior knowledge	0.54	*<0.01**	0.64	*<0.01**
6.	Seeking peer support	0.68	*<0.01**	0.73	*<0.01**
7.	Trying alternatives	0.76	*<0.01**	0.73	*<0.01**
8.	Making new guesses	0.74	*<0.01**	0.86	*<0.01**
9.	Logic reasoning	0.67	*<0.01**	0.87	*<0.01**
10.	Self-encouragement	0.73	*<0.01**	0.86	*<0.01**

1 N = 34
2 N = 43
3 Kendall's tau-b coefficient
* Significant at or beyond the 0.05 level

For **Agricultural Science students** a moderate although significant relationship was found for strategy no. 5 *'linking with prior knowledge'*. This is the same difficulty shown in the previous table of *Monitoring strategies*. Again, these students, who perceived themselves as poor in English, may not have much prior knowledge to draw on when problem solving. There was a very strong relationship for the other strategies.

Responses from **students in Communication Arts** showed a strong relationship between use of all *Problem-solving strategies* and their perceived relevance.

6.3.5 Strategies of the Evaluating Process

Table 6.15 (below) shows that the use of *Evaluating strategies* in learning English always related significantly to **students**' perceived relevance. However, they diverged in the strength of relationship, whereby once again the Communication Arts students showed stronger relationships overall.

Table 6.15 (STUDENTS) Association between the perceived relevance of evaluating strategies and the use of evaluating strategies in learning ENGLISH: Kendall's tau-b.

Evaluating Strategies	Ag. Sci.1		Comm. Arts2	
	tau-b[3]	*p*	tau-b[3]	*p*
1. Judging that the goal has been met	0.79	*<0.01*[*]	0.83	*<0.01*[*]
2. Strategy suitability & effectiveness	0.68	*<0.01*[*]	0.66	*<0.01*[*]
3. Within subject applicability	0.60	*<0.01*[*]	0.65	*<0.01*[*]
4. Other areas applicability	0.57	*<0.01*[*]	0.75	*<0.01*[*]
5. Seeking other suitable strategy	0.70	*<0.01*[*]	0.79	*<0.01*[*]
6. Summarizing lesson	0.63	*<0.01*[*]	0.74	*<0.01*[*]
7. Judging how much learned	0.72	*<0.01*[*]	0.82	*<0.01*[*]
8. Assessing correctness of the predictions	0.64	*<0.01*[*]	0.81	*<0.01*[*]
9. Comparing new knowledge with known knowledge	0.65	*<0.01*[*]	0.76	*<0.01*[*]
10. Judging worthiness of learning	0.71	*<0.01*[*]	0.85	*<0.01*[*]

1 N = 34
2 N = 43
3 Kendall's tau-b coefficient
* Significant at or beyond the 0.05 level

The responses of **students in Agricultural Sciences** showed a moderate although still significant relationship between perceived relevance and use for strategy no.4 *'(judging) other areas applicability'*. A stronger relationship was also found for this strategy in learning the MSC (see also Table 5.29). As mention earlier, only two English units are requirements for students from disciplines other than English. This might lessen opportunities for learners to apply the language knowledge learned unless the passages for listening and reading are applicable to their major subject.

Overall there was a very strong relationship between the **Communication Arts students**' use of *Evaluating strategies* and their perceptions of relevance.

SUMMARY

This chapter reported on metacognitive strategies in learning English. Students' perceived relevance, use of metacognitive strategies and correlations between the perceived relevance and their use were presented. Overall, students from Agricultural Sciences and Communication Arts rated the four metacognitive processes similarly as moderately relevant to

English listening/reading and no significant differences between the two disciplines were found (using the *Mann-Whitney U* test). At the individual level, however, measures of associations based on *Gamma* coefficients revealed that Communication Arts students gave significantly higher credit to two strategies: one was a *Problem-solving strategy (making a new guess)* and one an *Evaluating strategy (seeking other suitable strategy).*

For the <u>use</u> of metacognitive processes, *Mann-Whitney U* test results showed there was a significant difference for the *Planning* process in that *planning strategies* were used significantly more by Communication Arts students. These included *linking with prior knowledge, expecting the encountered problems, predicting outcomes* and *predicting the incoming information strategies*. Although no significant differences were found for the use of other metacognitive processes, there was evidence of significantly more frequent use of four individual strategies in Communication Arts. These included one *Monitoring strategy (seeking related prior knowledge);* two *Problem-solving strategies (revising the plan* and *self-encouragement)*; and one *Evaluating strategy (strategy suitability & effectiveness)*.

In terms of the relationship between perception of relevance and use of strategies, *Kendall's tau-b* results showed that, in general, the students' use of strategies related highly to their perceptions. Only one strategy showed no relationship, i.e., *'goal setting'*, in the Agricultural Sciences. Although almost half the Agricultural Science students perceived this *Planning strategy* as highly relevant, relatively few students reported actually using it. This might be a consequence of the more instructive tasks in their MSC.

The next chapter will focus on the metacognitive strategies that the students carry over from learning the MSC to learning English.

7. THE TRANSFER OF METACOGNITIVE STRATEGIES

OVERVIEW OF THE CHAPTER

This Chapter examines the extent to which students' perceptions and use of metacognitive strategies in learning the major subject content (MSC) are transferred to the learning of English. If perceptions of relevance or use of metacognitive processes *are* 'transferred' to the learning of English, we would expect ratings for strategies in the MSC and English to be very similar. To test this, measures of association were examined along with other summary statistics (such as medians and percentages). For the overall metacognitive processes (where scores could range from 10 to 50), *Spearman's Rank Order Correlations (rho)* were calculated and examined along with the median scores for the MSC and English and the results of *Wilcoxon Matched-Pairs Signed Ranks* tests[35]. For the individual metacognitive strategies (which were rated on a 5-point Likert scale), the percentage of positive responses[36] for MSC and English were considered in conjunction with *Kendall's tau-b* coefficients. *Kendall's tau-b* was chosen since, as described in Chapter 3 and 5, it is an appropriate measure of association for crosstabulations involving square tables – in this case, 5 x 5 categories (i.e., the Likert scales for MSC vs English). Compared to some other measures of association, *Kendall's tau-b* is quite a stringent test since the coefficient can only achieve +1.0 or –1.0 if all entries in the table are on one diagonal[37]. If the entries are spread throughout the table, thus indicating considerable variation in strategy use or perceived relevance between the MSC and English ratings, then the *tau-b* coefficient will be low or close to zero. The *tau-b* coefficient, whether it is high or low, indicates a number of students who gave similar ratings of use or perceived relevance of an individual strategy for both the MSC and English.

It is important to note that in determining whether students' perceptions and use of metacognitive strategies are transferred from the MSC to English, it was not sufficient to merely examine the correlation coefficients. While a relatively high coefficient (e.g. $\geq$+0.5) does indicate that students rated the process or strategy *similarly* for the MSC and English, it does not on its own indicate the extent to which the process or strategy was rated *positively*[2]. Hence, it was necessary to interpret the correlation coefficients in light of other statistics that summarized the students' ratings for the MSC and English – such as median scores or percentages of

[35] The *Wilcoxon Matched Pairs Signed-Ranks* test is a non-parametric equivalent of the paired samples *t*-test which was used to determine whether the MSC and English scores differ significantly.

[36] Positive responses are defined as the top two categories of the 5-point Likert scale. For perceived relevance, this means the 'agree' and 'strongly agree' categories. For strategy use, this means the 'often use' and 'always use' categories.

positive responses. For example, in relation to individual metacognitive strategies, only a high *tau-b* coefficient in conjunction with high percentages for both the MSC and English provide sufficient evidence that the students transferred their positive perceptions of relevance or use from the MSC to English. Other permutations are either inconclusive or indicative of consistently low perceptions of relevance or levels of use for both the MSC and English. Further explanation about the interpretation of the percentages and *tau-b* coefficients will be provided within the relevant sections.

7.1 TRANSFER OF PERCEIVED RELEVANCE

7.1.1 Overall Metacognitive Processes

Overall, the results (see Table 7.1 below) suggest that there was more consistent transfer of perceptions about the relevance of metacognitive processes among the Agricultural Science students than among the Communication Arts students. However, it is important to see whether this is borne out when examining the individual metacognitive strategies.

As shown in Table 7.1, the *Spearman* correlations for the **Agricultural Science** students were high for all four metacognitive processes (*rho* > 0.6), suggesting that the MSC and English ratings were very similar. This was confirmed by the results of *Wilcoxon Matched-Pairs Signed-Ranks* tests which showed that there were no significant differences between the distributions of the MSC and English ratings (see Appendix 7.1).

Table 7.1 STUDENTS - Perceived relevance of metacognitive processes in learning MSC vs English

	Median[1]		**Spearman Rank Order Correlation**	
	MSC	***English***	**rho**	***p***
Agri.Sci (N = 34)				
Planning	35.0	*35.5*	0.74	*< 0.01**
Monitoring	37.0	*38.0*	0.75	*< 0.01**
Problem-Solving	35.0	*34.5*	0.74	*< 0.01**
Evaluating	36.0	*36.5*	0.63	*< 0.01**
Comm. Arts (N = 44)				
Planning	37.5	*37.5*	0.64	*< 0.01**
Monitoring	38.0	*38.5*	0.54	*< 0.01**
Problem-Solving	35.0	*34.0*	0.25	*0.12*
Evaluating	39.0	*37.0*	0.54	*< 0.01**

1 Scores could range from a minimum of 10 to a maximum of 50.

* Significant at or beyond the 0.05 level.

[37] For example, *tau-b* could reach +1.0 if every student rated the strategy exactly the same for both the MSC and English.

The **Communication Arts** students' ratings for the MSC and English were more variable. Table 7.1 (above) shows that the correlations between the MSC and English ratings tend to be weaker, particularly in relation to *Problem-solving* (*rho* = 0.25), which does not achieve statistical significance. However, later in this chapter, we shall see that significant differences do exist between the MSC and English ratings for some of the individual *Problem-solving strategies*.

7.1.2 Planning Strategy Relevance

Table 7.2 (below) shows the per cent of students who agreed or strongly agreed that individual *Planning strategies* are relevant to both learning the MSC and to learning English. *Kendall's tau-b* coefficients are provided as a measure of the association between the students' ratings for the MSC and English. As described earlier, a perfect positive relationship, where *tau-b* equals 1.0, can only be achieved when all entries in the 5 x 5 table are on one diagonal (e.g., where each student rated the relevance of the strategy the same for both MSC and English). Hence, the closer the *tau-b* coefficient is to 1.0, the greater the similarity between the ratings and - if the percentages of agreement are also high (shaded in tables below) – the greater the likelihood that students' perceptions about the relevance of the strategy in learning the MSC are transferred to the learning of English.

As is evident in Table 7.2 below, students from **both disciplines** to some extent carried over their perceptions of the relevance of *Planning strategies*. However, since the *Kendall's tau-b* coefficients tend to be higher for the Agricultural Science students, this suggests that their perceptions about the relevance of *Planning strategies* to learning both the MSC and English were more consistent than those of their Communication Arts peers.

As seen in Table 7.2 below, the greatest likelihood that **Agricultural Science** students transferred their perceptions of relevance (high agreement and high *tau-b*) was found for strategy no. 5 *'intending to ignore distractions'*. Other results were inconclusive, that is, the *Kendall's tau-b* tests show a significant positive relationship between MSC and English ratings by students in Agricultural Sciences, even though the per cent agreement figures are not very high**.** For example, strategy no. 7 *'predicting outcomes'*, showed a very strong relationship between MSC and English ratings (*tau-b* = 0.74), however the per cent agreement figures were low (< 40 per cent). This indicates that a small percentage of students consistently perceived the strategy as having relevance to learning either the MSC or English. Conversely, there was no significant relationship for strategy no. 6 *'preparing to confront obstacles'* (*tau-b* = 0.25), yet more than 70 per cent of students agreed or strongly agreed about its relevance to both the MSC and English. This is because a substantial minority of students gave rather similar ratings for the MSC and English. The low English proficiency that students reported in their self reports might affect their perceptions of planning across the two subjects. In fact, for some strategies, students tended to perceive the relevance to English more highly than to the MSC, e.g., no. 4 '*expecting the encountered problems'* and no. 9 *'choosing strategies for the task'*, indicating that they may have perceived these strategies as more appropriate to English or that they might have perceived them as relevant *only* in the course of learning English. Moreover, the less instructive English tasks (i.e., students were assigned to listen to or read English after learning and practising language and linguistic features relevant to the task) might encourage students to look for difficulties or problems they would face in English before engaging a task.

Table 7.2 STUDENTS – Perceived relevance of planning strategies in learning MSC vs English

Planning Strategies		Per cent agreement[1]		Kendall's tau-b	
		MSC	English	tau-b	p
1. Goal setting	Ag.Sci	59	47	0.50	<0.01*
	Comm.Arts	*52*	*56*	*0.35*	*<0.01**
2. Directing attention selectively	Ag.Sci	45	53	0.41	<0.01*
	Comm.Arts	*68*	*77*	*0.28*	*0.04**
3. Linking with prior knowledge	Ag.Sci	51	56	0.48	<0.01*
	Comm.Arts	*63*	*66*	*0.62*	*<0.01**
4. Expecting the encountered problems	Ag.Sci	30	51	0.43	<0.01*
	Comm.Arts	*46*	*63*	*0.33*	*0.01**
5. Intending to ignore distractions	Ag.Sci	61	67	0.52	<0.01*
	Comm.Arts	*73*	*78*	*0.47*	*<0.01**
6. Preparing to confront obstacles	Ag.Sci	74	73	0.25	0.10
	Comm.Arts	*80*	*74*	*0.47*	*<0.01**
7. Predicting outcomes	Ag.Sci	36	38	0.74	<0.01*
	Comm.Arts	*30*	*40*	*0.40*	*<0.01**
8. Predicting the incoming information	Ag.Sci	45	47	0.56	<0.01*
	Comm.Arts	*46*	*58*	*0.42*	*<0.01**
9. Choosing strategies for the task	Ag.Sci	36	59	0.44	<0.01*
	Comm.Arts	*49*	*57*	*0.20*	*0.13*
10. Work ordering	Ag.Sci	62	60	0.45	<0.01*
	Comm.Arts	*75*	*76*	*0.32*	*0.02**

1 Per cent of students who said they 'agree' or 'strongly agree' the strategy is relevant.
* Significant at or beyond the 0.05 level.

In **Communication Arts**, only strategy no 3 shows both a high *tau*-b (0.62) and high levels of agreement. This is indicative of the strategy (*linking with prior knowledge*) being applied consistently in both the MSC and in English. There was a moderate relationship between students' MSC and English ratings for most strategies, with a low relationship for strategy 2 (*tau-b* = 0.28) which illustrates that even where there is a relatively high level of per cent agreement, it cannot be assumed that most students will carry over their perceptions from MSC to English. There was no significant relationship for strategy 9 *'choosing strategies for the task'*, but a slightly higher proportion of students in this field perceived it as being more relevant to learning English than to learning the MSC. The minor difference between per cent agreement figures for MSC and English suggests that Communication Arts students may not be advanced enough in their English language study to reflect objectively on the appropriateness of strategies for the different types of learning.

7.1.3 Monitoring Strategy Relevance

The relevance of different *Monitoring strategies* (nos. 4, 6 and 8 in Agricultural Sciences; and nos. 1, 5 and 7 in Communication Arts) appear to be carried from learning the MSC to learning English among the **two disciplines** (see Table 7.3 below). One strategy (no. 3 *'detecting weaknesses/ obstacles'*) was carried over by both groups of students. Interestingly, a stronger correlation between the two sets of ratings existed for the whole process in Agricultural Sciences even though there were more strategies seen as relevant to both the MSC and English among Communication Arts students than their Agricultural Science peers (see also Table 7.1).

A strong association between the **Agricultural Science** students' MSC and English ratings was found for strategy no. 8 *'checking importance of the information'* (*tau-b* = 0.69), which was also rated as highly relevant to learning both the MSC (82 per cent) and English (76 per cent). The slightly lower percentage for relevance to English suggests that some students may have not been able to carry over this strategy to the new context. As discussed in chapter 2, *'checking importance of the information'* is a sophisticated metacognitive strategy more appropriate to knowledge content learning (MSC) than to language learning, so FL/SL listening and reading tasks may not support its use since the focus is on comprehension rather than content. As a consequence learners may not always consider it relevant. Even though the *tau-b* was weaker, there is evidence that strategies 3 *'detecting weaknesses/obstacles'* (*tau-b* = 0.58), 4 *'seeking related prior knowledge'* and 6 *'checking the attention'* (*tau-b* = 0.54) were also applied to both subject areas. Among the Agricultural Science students, strategy no. 5 *'checking the retrieval of expected information'* was the only *Monitoring strategy* for which there was no significant association between the MSC and English ratings. In the MSC, this strategy would involve new scientific or technological content relevant to the subject. In English, however, it would involve broader knowledge about the language or information about the text and this might have prevented these students from seeing the strategy as immediately relevant to learning their FL.

There was further evidence that some strategies were seen as more relevant to one subject than to the other. For instance, the per cent agreement showed that strategies 1, 4 and 10 were seen as more relevant to learning English than to learning the MSC, while the reverse occurred for strategy nos. 5, 7 and 9. Strategies 1 *'comprehension check'* (e.g., asking oneself whether a word, a sentence and/or a paragraph makes sense, 2 *'checking progress'* and 4 *'seeking related prior knowledge'* (such as knowledge about the topics, related words, grammatical rules and/or syntax) were frequently mentioned in self reports and the think-aloud protocols when learning English, suggesting that they would be directly relevant to comprehending English.

Table 7.3 STUDENTS – Perceived relevance of monitoring strategies in learning MSC vs English

Monitoring Strategies		Per cent agreement[1]		Kendall's tau-b	
		MSC	English	tau-b	p
1. Comprehension check	Ag.Sci	45	67	0.38	0.02*
	Comm.Arts	*57*	*62*	*0.64*	*<0.01**
2. Checking progress	Ag.Sci	63	69	0.41	0.01*
	Comm.Arts	*63*	*63*	*0.33*	*0.01**
3. Detecting weaknesses/obstacles	Ag.Sci	75	69	0.58	<0.01*
	Comm.Arts	*62*	*63*	*0.51*	*<0.01**
4. Seeking related prior knowledge	Ag.Sci	50	63	0.52	<0.01*
	Comm.Arts	*66*	*65*	*0.39*	*<0.01**
5. Checking the retrieval of expected information	Ag.Sci	63	54	0.22	0.14
	Comm.Arts	*57*	*65*	*0.68*	*<0.01**
6. Checking the attention	Ag.Sci	82	76	0.54	<0.01*
	Comm.Arts	*68*	*68*	*0.42*	*<0.01**
7. Checking appropriateness of the strategy used	Ag.Sci	63	42	0.42	<0.01*
	Comm.Arts	*55*	*59*	*0.53*	*<0.01**
8. Checking importance of the information	Ag.Sci	82	76	0.69	<0.01*
	Comm.Arts	*61*	*67*	*0.47*	*<0.01**
9. Checking the linkage to other subjects	Ag.Sci	66	57	0.46	<0.01*
	Comm.Arts	*57*	*47*	*0.67*	*<0.01**
10. Checking correctness of the predictions	Ag.Sci	39	48	0.46	<0.01*
	Comm.Arts	*32*	*47*	*0.67*	*<0.01**

1 Per cent of students who said they 'agree' or 'strongly agree' the strategy is relevant.

* Significant at or beyond the 0.05 level.

Table 7.3 shows a significant positive relationship between **Communication Arts** students' MSC and English ratings for all *Monitoring strategies* but only the relevance of strategies 1 *'comprehension check'*, 3 *'detecting weaknesses/obstacles'*, 5 *'checking the retrieval of expected information'* and 7 *'checking appropriateness of the strategy used'* showed evidence of being transferred across the two subject areas. Even though a significant positive relationship in the presence of more than 60 per cent of students rating strategy nos. 2, 4 and 8 as relevant either to the MSC or English, the *Kendall's tau-b* coefficients were not strong. This indicates that these students' perceptions of relevance were not rated consistently in the MSC and English. As was evident in the self reports, few of the English units provided for students in Communication Arts focused on language comprehension and the fact that many students just wanted to pass the unit might prevent them from recognising the relevance of *checking their progress* (no. 2), *seeking related prior knowledge* (no. 4), *checking importance of the information* (no. 8). On the other hand, high *tau-b* and low percentages (e.g., 9 and 10) suggested that these students saw the relevance of strategies for the MSC and English differently. Higher per cent agreement was found for one subject over another, e.g., no. 10 *'checking correctness of the predictions'* was higher for learning English than for the MSC, suggesting that the strategy was perceived as more relevant in learning English.

7.1.4 Problem-Solving Strategy Relevance

Table 7.4 (below) shows that **both groups of students** transferred perceptions of the relevance of a limited number of *Problem-solving strategies* from learning the MSC to English. A strong relationship between learning the two subject areas and high per cent agreement was found for more strategies in Agricultural Sciences (e.g., nos. 1, 7, 9 and 10) than in Communication Arts (e.g., no. 10). This supports the significant difference found for the overall Problem-solving process between the two disciplines (see Table 7.1).

Table 7.4 shows that among the **Agricultural Science** students, there is some evidence of transfer of their perceptions of four *Problem-solving strategies* across the two contexts. Particularly strong associations between their MSC and English ratings were found for strategies 7 *'trying alternatives'* and 10 *'self-encouragement'*. Quite the opposite was found for strategy no. 5 *'linking with prior knowledge'* where the rather weak *Kendall's tau-b* coefficient (*tau-b* = 0.38) and high per cent agreement figures for MSC and English suggest that while relatively few Agricultural Science students rated the relevance of the strategy similarly for both the MSC and English, most did not. The reverse was found for strategy no. 8 *'making new guesses'* where a minority of students saw it as relevant to learning either the MSC or English (low percentages and high *tau-b* coefficient). It is possible here that the instructive teaching and learning in Agricultural Sciences where students get close guidance, as reported in the interview and self reports, may not encourage them to take risks or make guesses when learning the MSC or English. Also students' failure in English, as reported in the self reports, might discourage them from considering the relevance of guessing as a learning strategy.

Table 7.4 STUDENTS – Perceived relevance of problem-solving strategies in learning MSC vs English

Problem-Solving Strategies		Per cent agreement[1]		Kendall's tau-b	
		MSC	English	tau-b	p
1. Revising the plan	Ag.Sci	65	56	0.51	<0.01*
	Comm.Arts	*70*	*67*	*0.41*	*<0.01**
2. Accessing various resources	Ag.Sci	41	30	0.58	<0.01*
	Comm.Arts	*55*	*37*	*0.53*	*<0.01**
3. Ignoring problems	Ag.Sci	30	27	0.47	<0.01*
	Comm.Arts	*17*	*26*	*0.59*	*<0.01**
4. Asking for clarification	Ag.Sci	42	45	0.51	<0.01*
	Comm.Arts	*51*	*29*	*0.25*	*0.06*
5. Linking with prior knowledge	Ag.Sci	71	53	0.38	0.01*
	Comm.Arts	*68*	*60*	*0.44*	*<0.01**
6. Seeking peer support	Ag.Sci	45	54	0.69	<0.01
	Comm.Arts	*43*	*65*	*0.51*	*<0.01**
7. Trying alternatives	Ag.Sci	61	56	0.64	<0.01*
	Comm.Arts	*60*	*54*	*0.33*	*0.01**
8. Making new guesses	Ag.Sci	33	38	0.69	<0.01*
	Comm.Arts	*50*	*44*	*0.50*	*<0.01**
9. Logic reasoning	Ag.Sci	50	53	0.57	<0.01*
	Comm.Arts	*39*	*46*	*0.51*	*<0.01**
10. Self-encouragement	Ag.Sci	75	60	0.61	<0.01*
	Comm.Arts	*86*	*79*	*0.66*	*<0.01**

1 Per cent of students who said they 'agree' or 'strongly agree' the strategy is relevant.

* Significant at or beyond the 0.05 level.

The evidence in Table 7.4 suggests that **Communication Arts** students carried over their perceptions of relevance of only one strategy from learning MSC to English (i.e., no. 10). Relatively weak associations for strategy nos. 1 *'revising the plan',* 5 *'linking with prior knowledge'* and 7 *'trying alternatives'* where even though more than half the students rated them as highly relevant to the MSC and English, the low *tau-b* indicates variation in their ratings. These results, in conjunction with the absence of a significant relationship for strategy 4 *'asking for clarification'*, probably contribute to the lack of a significant relationship for the whole *Problem-solving* process (see Table 7.1 above).

The per cent agreement figures in Table 7.4 show that the Communication Arts students perceived greater relevance for most strategies for learning the MSC than for learning English. As found in the interviews, these students reported they could find ways to overcome the MSC learning problems independently. In fact they might even find it challenging to practise different strategies to overcome an MSC problem (e.g., no. 5). However, since they consider themselves poor in English, they were less likely to see the relevance of some strategies as relevant to English. For example, only minority of students were consistently rated (high *tau-b*) the relevance of strategy no. 2 *'accessing various resources'* for both the MSC and English (high per cent for the MSC but low for English). Low level confidence might also result in their not seeing the importance of *'asking for clarification'* (no. 4) from lecturers. Unlike the other strategies, the per cent agreement figures show that strategy nos. 3 *'ignoring problems',* 6 *'seeking peer support'* and 9 *'logic reasoning'* were perceived as more highly relevant to learning English than to learning the MSC. The students' poor English proficiency could have caused them to ignore problems, look for assistance from peers or think more logically.

7.1.5 Evaluating Strategy Relevance

The evidence in Table 7.5 below confirms results of Table 7.1 that even though perceiving *Evaluating strategies* as less relevant for learning the MSC and English, Agricultural Science students showed more consistency in their perceptions of relevance than those of the Communication Arts students. Generally, more students in Communication Arts agreed on the relevance of these strategies than their Agricultural Sciences peers, but the lower *Kendall's tau-b* coefficients show these students saw the relevance of these strategies for both areas of study differently. This is particularly for strategy no. 1 *'judging whether the goal has been met,* where fewer Agricultural Science students perceived it as relevant for the MSC and carried over their perceptions to English. On the contrary, a greater number of Communication Arts who saw its relevance for the MSC did not see its relevance for English and those majority who saw the relevance for English did not think it was relevant for the MSC. Quite the opposite was found for strategy no. 7 *'judging how much learned'*. That is, low percentages and high *tau-b* showed that Agricultural Science students carried over the perceptions that the strategy was not relevant to either the MSC or English, but the majority of Communication Arts who saw it as relevant to the MSC did not see it as relevant for English and those who rated it as relevant for English did not rate it for the MSC. The reverse was true for strategy 10 *'judging worthiness of learning'* where Communication Arts students were more consistent in ratings for both the MSC and English (higher *tau-b*). However, both groups of students carried over its relevance between the two subject areas.

As shown in Table 7.5, high per cent agreement and high *tau-b* coefficients suggest that five *Evaluating strategies* (e.g., 1, 2, 6, 9 and 10) were carried over across learning the MSC and English among **Agricultural Sciences** students. The low *tau-b* results with high percentages for nos. 3 *'within subject applicability'* and 4 *'other areas applicability'* suggest that many students perceived the relevance of the strategies differently for the MSC and English.

Table 7.5 STUDENTS – Perceived relevance of evaluating strategies in learning MSC vs English

Evaluating Strategies		Per cent agreement[1] MSC	English	Kendall's tau-b tau-b	p
1. Judging that the goal has been met	Ag.Sci	67	64	0.54	<0.01*
	Comm.Arts	*75*	*72*	*0.48*	*<0.01**
2. Strategy suitability & effectiveness	Ag.Sci	50	53	0.57	<0.01*
	Comm.Arts	*75*	*65*	*0.55*	*<0.01**
3. Within subject applicability	Ag.Sci	53	53	0.29	0.05*
	Comm.Arts	*58*	*52*	*0.19*	*0.15*
4. Other areas applicability	Ag.Sci	71	59	0.32	0.03*
	Comm.Arts	*75*	*60*	*0.37*	*<0.01**
5. Seeking other suitable strategy	Ag.Sci	44	38	0.45	<0.01*
	Comm.Arts	*64*	*61*	*0.47*	*<0.01**
6. Summarizing lesson	Ag.Sci	58	62	0.50	<0.01*
	Comm.Arts	*66*	*58*	*0.50*	*<0.01**
7. Judging how much learned	Ag.Sci	47	44	0.65	<0.01*
	Comm.Arts	*65*	*64*	*0.41*	*<0.01**
8. Assessing correctness of the predictions	Ag.Sci	33	52	0.48	<0.01*
	Comm.Arts	*43*	*46*	*0.37*	*<0.01**
9. Comparing new knowledge with known knowledge	Ag.Sci	67	61	0.51	<0.01*
	Comm.Arts	*71*	*56*	*0.40*	*<0.01**
10. Judging worthiness of learning	Ag.Sci	70	64	0.56	<0.01*
	Comm.Arts	*68*	*68*	*0.70*	*<0.01**

1 Per cent of students who said they 'agree' or 'strongly agree' the strategy is relevant.
* Significant at or beyond the 0.05 level.

The results in Table 7.5 also support those in Table 7.1 where **Communication Arts** students' perceptions of the relevance of *Evaluating strategies* for learning the MSC and English were more variable. No significant relationship was found for strategy no. 3 *'within subject applicability'*. A strong association was only found for strategy 10 *'judging worthiness of learning'* and to a lesser extent for no. 2 *'strategy suitability and effectiveness'*. The high result for no 10 may be, as mentioned in the interviews and self reports, because many students did not think English essential to their learning or to their daily life.

7.2 TRANSFER OF STRATEGY USE

7.2.1 Overall Metacognitive Processes

Table 7.6 (below) shows the median scores and *Spearman Rank Order* correlations for the Agricultural Sciences and Communication Arts students' ratings of the actual use of metacognitive processes in learning the MSC and English. Compared with their

Communication Arts counterparts, there were markedly higher correlations among Agricultural Science students indicating that they were more consistent in the use of metacognitive processes in both learning the MSC and English even though the median scores show that fewer students used them. The greatest difference between **the two disciplines** in terms of the likelihood of transfer of use was evident for the *Problem-solving* process (*rho* = 0.80 in Agricultural Sciences; *rho* = 0.33 in Communication Arts).

As shown in Table 7.6, *Spearman* correlations for **Agricultural Science** students are high for all four metacognitive processes (*rho*>0.50), suggesting that overall the MSC and English ratings were quite similar. This is confirmed by the results of *Wilcoxon Matched-Pairs Signed Ranks* tests which show that there were no significant differences for the two sets of the ratings (see Appendix 7.2).

Table 7.6 STUDENTS – Use of metacognitive processes in learning MSC vs English

	Median[1]		Spearman Rank Order Correlation	
	MSC	**English**	**rho**	**p**
Agri.Sci (N = 34)				
Planning	32.0	31.0	0.59	< 0.01*
Monitoring	35.0	33.0	0.83	< 0.01*
Problem-Solving	34.0	33.0	0.80	< 0.01*
Evaluating	35.0	34.5	0.68	< 0.01*
Comm. Arts (N = 44)				
Planning	35.0	35.0	0.57	< 0.01*
Monitoring	37.0	35.5	0.53	< 0.01*
Problem-Solving	34.5	34.0	0.33	0.05*
Evaluating	39.0	35.0	0.49	< 0.01*

1 Maximum score equals 50, minimum score equals 10.

* Significant at or beyond the 0.05 level.

Communication Arts students' ratings for the MSC and English were more variable. Table 7.6 shows that the correlations between the two sets of their ratings are weaker, particularly in relation to *Problem-solving* (*rho* = 0.33). However, according to the mean ranks for the *Wilcoxon* test (shown in Appendix 7.2), the metacognitive process of *Problem-solving* was used more when learning the MSC than learning English. As might be expected from the median scores shown in Table 7.6, the *Wilcoxon* tests revealed that there was a significant difference between ratings for *Evaluating strategies* which overall, were used more frequently in the MSC than in English.

7.2.2 Planning Strategy Use

The moderate association between MSC and English ratings found for **the two disciplines** in relation to the overall *Planning* process (see Table 7.6 above) was reflected in the moderate relationship for many of the individual strategies. As shown in Table 7.7 below, in general, a greater proportion of Communication Arts students frequently used *Planning strategies*, but once again the *Kendall's tau-b* coefficients show a tendency for weaker associations between the MSC and English than for Agricultural Science students. This is particularly true for strategies 2 *'directing attention selectively'* and 5 *'intending to ignore distractions'*, which the Communication Arts students reported using more often in learning the MSC than English, while the reverse was true for the Agricultural Science students.

Table 7.7 STUDENTS – Use of planning strategies in learning MSC vs English

Planning Strategies		Per cent frequent use[1]		Kendall's tau-b	
		MSC	English	tau-b	p
1. Goal setting	Ag.Sci	35	29	0.29	0.05*
	Comm.Arts	*32*	*37*	*0.27*	*0.04**
2. Directing attention selectively	Ag.Sci	26	41	0.59	<0.01*
	Comm.Arts	*56*	*42*	*0.26*	*0.03**
3. Linking with prior knowledge	Ag.Sci	27	27	0.42	*0.02**
	Comm.Arts	*61*	*56*	*0.41*	*<0.01**
4. Expecting the encountered problems	Ag.Sci	37	30	0.40	0.01*
	Comm.Arts	*48*	*57*	*0.33*	*0.01**
5. Intending to ignore distractions	Ag.Sci	48	61	0.56	<0.01*
	Comm.Arts	*72*	*56*	*0.29*	*0.03**
6. Preparing to confront obstacles	Ag.Sci	57	62	0.24	0.16
	Comm.Arts	*66*	*65*	*0.38*	*<0.01**
7. Predicting outcomes	Ag.Sci	22	24	0.62	<0.01*
	Comm.Arts	*43*	*52*	*0.54*	*<0.01**
8. Predicting the incoming information	Ag.Sci	37	29	0.56	<0.01*
	Comm.Arts	*54*	*52*	*0.42*	*<0.01**
9. Choosing strategies for the task	Ag.Sci	27	30	0.24	0.23
	Comm.Arts	*53*	*55*	*0.45*	*<0.01**
10. Work ordering	Ag.Sci	57	50	0.53	<0.01*
	Comm.Arts	*68*	*63*	*0.44*	*<0.01**

1 Per cent of students who said they 'often use' or 'always use' the strategy.
* Significant at or beyond the 0.05 level.

Among the **Agricultural Science** students, only strategy 10 *'work ordering'* appears to be used moderately frequently and consistently for learning both the MSC and English (i.e., the per cent frequent use figures and *tau-b* coefficients are somewhat higher than for other strategies). The higher per cent use in learning English for strategy 5 *'intending to ignore distraction'* suggests that some students might have developed the strategy when learning English and it is not surprising if they consider the subject difficult. Conversely, the low proportions of students' use and the non-significant *tau-b* coefficient for strategy 9 *'choosing strategies for the task'* suggest the strategy was not likely to be used for either subject area. The failure to choose strategies is a concern for students' metacognitive development and for their development as independent learners and demonstrates a need for assistance in this skill. The relatively strong association (*tau-b* = 0.62) and low percentage frequent use confirm that strategy 7 *'predicting outcomes'* although not commonly used by Agricultural Science students but may be consistently used for the MSC and English by a small number of students. Strategy 6 *'preparing to confront obstacles'*, on the other hand, is used relatively frequently in learning the MSC and English, but not in a consistent way across the two contexts - hence the low *tau-b* coefficient. The limited English units available and, as is evident in the self reports, the lack of continuing English learning, might explain why there is a marginal application of the strategies such as *goal setting* (no. 1), *linking with prior knowledge* (no. 3). Poor English proficiency and lack of motivation, as reported, may result in the limited use of strategies 4 *'expecting the encountered problem'* and 8 *'predicting the incoming information'*.

Relatively weak associations between **Communication Arts** students' MSC and English ratings, in spite of high per cent use was found for many *Planning strategies*, suggesting less likelihood of transfer to learning English (see Table 7.7 above). This is particularly so for no. 2 *'directing attention selectively'* and no. 5 *'intending to ignore distractions'* when far less use was recorded for learning English than for learning the MSC. A higher per cent use in English was found for strategies 1 *'goal setting'*, 4 *'expecting the encountered problem'* and 7 *'predicting outcomes'* suggesting that some students might have developed these strategies when learning English.

7.2.3 Monitoring Strategy Use

As seen for *Planning strategies*, a greater number of students in Communication Arts reported frequent use of all *Monitoring Strategies*, but stronger associations were found between Agricultural Science students' ratings for the MSC and English (e.g., strategies 2, 7 and 8). This support the stronger correlations of the Agricultural Science students' ratings for the Monitoring process in Table 7.6.

As is evident in Table 7.8 below, **Agricultural Science students** consistently used *Monitoring strategies* 3 *'detecting weaknesses/obstacles'* and 6 *'checking the attention'* (*tau-b* = 0.85) in both subjects. Particularly strong association was found for strategy 8 *'checking importance of the information'* (*tau-b* = 0.87), but low per cent use for learning English, indicating that about half the students did not use this strategy for learning both the MSC and English. There was no significant relationship found for strategy 5 *'checking the retrieval of information'* (*tau-b* = 0.24) and a rather weak association was found for strategy 9 *'checking the linkage to other subjects'* (*tau-b* = 0.38). As reported in the interviews, lecturers in the MSC thought it their duty to check whether their students understood or received sufficient information for accomplishing a task and this might not enhance the students' use of the more independent strategies in the MSC, e.g., nos. 5 and 9, and might in turn affect their application in learning English.

Table 7.8 STUDENTS – Use of monitoring strategies in learning MSC vs English.

Monitoring Strategies		Per cent frequent use[1]		Kendall's tau-b	
		MSC	English	tau-b	p
1. Comprehension check	Ag.Sci	36	42	0.54	<0.01*
	Comm.Arts	*60*	*51*	*0.61*	*<0.01**
2. Checking progress	Ag.Sci	54	57	0.50	<0.01*
	Comm.Arts	*64*	*58*	*0.25*	0.06
3. Detecting weaknesses/obstacles	Ag.Sci	60	72	0.54	<0.01*
	Comm.Arts	*62*	*60*	*0.49*	*<0.01**
4. Seeking related prior knowledge	Ag.Sci	37	36	0.47	<0.01*
	Comm.Arts	*60*	*65*	*0.49*	*<0.01**
5. Checking the retrieval of expected information	Ag.Sci	55	42	0.24	0.10
	Comm.Arts	*55*	*48*	*0.46*	*<0.01**
6. Checking the attention	Ag.Sci	65	57	0.85	<0.01*
	Comm.Arts	*70*	*53*	*0.48*	*<0.01**
7. Checking appropriateness of the strategy used	Ag.Sci	37	45	0.61	<0.01*
	Comm.Arts	*59*	*52*	*0.52*	*<0.01**
8. Checking importance of the information	Ag.Sci	54	42	0.87	0.01*
	Comm.Arts	*68*	*56*	*0.47*	*<0.01**
9. Checking the linkage to other subjects	Ag.Sci	39	48	0.38	0.01*
	Comm.Arts	*50*	*46*	*0.42*	*<0.01**
10. Checking correctness of the predictions	Ag.Sci	33	27	0.56	<0.01*
	Comm.Arts	*26*	*46*	*0.57*	*<0.01**

1 Per cent of students who said they 'often use' or 'always use' the strategy.

* Significant at or beyond the 0.05 level.

Relatively high per cent frequent use and strong associations between the MSC and English ratings by **Communication Arts** students were found for strategies 1 *'comprehension check'* and 7 *'checking appropriateness of the strategy used'*, indicating that the strategies were used in both areas of study. The low *tau-b* but high percentages for strategy 2 *'checking progress'* indicates that the strategy was used differently for the MSC and English. It is possible that students with low competence in English will not be motivated to check their progress in it, hence the low *tau-b* coefficient. Interestingly, marginally more frequent use of strategies 4 *'seeking related prior knowledge'* and 10 *'checking correctness of the predictions'* in learning English suggests that some students have developed the ability to use this strategy when facing the challenge of learning FL. Reverse results were found for strategies 6 *'checking the attention'* and 8 *'checking importance of the information'* which were more frequently used in learning the MSC.

7.2.4 Problem-Solving Strategy Use

A strong association between Agricultural Science students' use of the *Problem solving* process (see Table 7.6 above) is confirmed by a relatively strong relationship for most of the individual strategies (*tau-b*> 50) (de Vaus, 2002). This is not the case in Communication Arts where more variability in the associations between the two sets of ratings was found (see Table 7.9 below). Substantial differences between the associations for **the two disciplines** were found for strategies 1, 4 and 6, in each case, the association between ratings on frequent use in learning the MSC and English was much stronger for the Agricultural Science students than the Communication Arts students.

Table 7.9 STUDENTS – Use of problem-solving strategies in learning MSC vs English

Problem-Solving Strategies		Per cent frequent use[1]		Kendall's tau-b	
		MSC	English	tau-b	p
1. Revising the plan	Ag.Sci	53	47	0.63	<0.01*
	Comm.Arts	*60*	*65*	*0.38*	*0.01**
2. Accessing various resources	Ag.Sci	29	39	0.51	<0.01*
	Comm.Arts	*52*	*39*	*0.46*	*<0.01**
3. Ignoring problems	Ag.Sci	36	30	0.66	<0.01*
	Comm.Arts	*17*	*16*	*0.54*	*<0.01**
4. Asking for clarification	Ag.Sci	48	36	0.58	<0.01*
	Comm.Arts	*46*	*26*	*0.15*	*0.25*
5. Linking with prior knowledge	Ag.Sci	41	38	0.48	<0.01*
	Comm.Arts	*64*	*56*	*0.30*	*0.01**
6. Seeking peer support	Ag.Sci	54	60	0.78	<0.01*
	Comm.Arts	*45*	*63*	*0.38*	*<0.01**
7. Trying alternatives	Ag.Sci	53	41	0.51	<0.01*
	Comm.Arts	*60*	*56*	*0.29*	*0.05**
8. Making new guesses	Ag.Sci	44	50	0.66	<0.01*
	Comm.Arts	*51*	*49*	*0.62*	*<0.01**
9. Logic reasoning	Ag.Sci	47	33	0.48	<0.01*
	Comm.Arts	*35*	*38*	*0.63*	*<0.01**
10. Self-encouragement	Ag.Sci	54	54	0.71	<0.01*
	Comm.Arts	*84*	*79*	*0.58*	*<0.01**

1 Per cent of students who said they 'often use' or 'always use' the strategy.

* Significant at or beyond the 0.05 level.

There were very strong associations between ratings of strategy use in learning the MSC and learning English by **Agricultural Science** students for strategies 6 *'seeking peer support'* (*tau-b* = 0.78) and 10 *'self-encouragement'* (*tau-b* = 0.71), both of which were frequently used by more than 50 per cent of students. These were quite different from results of the self-reports and think-aloud protocols, which showed that many Agricultural Science students lack motivation in learning English and tended towards avoidance strategies. This will be discussed in chapter 9. Strong positive relationships were also found for other strategies although not matched with such frequency of use, e.g., 2, 3, 7 & 8.

As is evident in Table 7.9, high per cent use and strong significant associations between the ratings of strategy use by **Communication Arts** students were found for only strategy no. 10. There was no significant relationship between the MSC and English ratings for strategy 4 *'asking for clarification'*, and the per cent frequent use was substantially lower for English than MSC. Few students used this strategy to learn English and like their Agricultural Science peers, the Communication Arts students may be reluctant to expose their weaknesses by asking questions.

7.2.5 Evaluating Strategy Use

The difference between the use of *Evaluating strategies* for learning both the MSC and English by students in **both disciplines** in Table 7.6 is evident in Table 7.10 below. Even though many strategies were rated by more Communication Arts students, Agricultural Science students showed more consistent use of strategies for learning both subject areas (e.g., the high *tau-b* results for nos. 1, 7, 9 and 10 in Agricultural Sciences; and no. 1 in Communication Arts). However, only one *Evaluating strategy* each was used for both the MSC and English by these groups of students. Fewer strategies were transferred across the subject areas compared with a transfer of perceiving relevance strategies indicates that these students did not use all strategies they perceived as relevant.

There was relatively high per cent frequent use and strong association between the two sets of ratings by **Agricultural Science** students for strategy 9 *'comparing new knowledge with known knowledge'*. These students showed a reluctance of using evaluating strategies for learning English, with the exception of strategy 7 *'judging how much learned'* (higher per cent use for English than for the MSC). Evidence from the think aloud protocols also suggests that strategy 7 is used quite frequently in learning English: students often reflected on how much they have understood. No significant relationship was found for strategy 4 *'other areas applicability'*.

Table 7.10 STUDENTS – Use of evaluating strategies in learning MSC vs English

Evaluating Strategies		Per cent frequent use[1]		Kendall's tau-b	
		MSC	English	tau-b	p
1. Judging that the goal has been met	Ag.Sci	56	44	0.67	<0.01*
	Comm.Arts	*73*	*67*	*0.45*	*<0.01**
2. Strategy suitability & effectiveness	Ag.Sci	44	44	0.42	0.01*
	Comm.Arts	*69*	*67*	*0.35*	*0.03**
3. Within subject applicability	Ag.Sci	35	33	0.48	<0.01*
	Comm.Arts	*60*	*52*	*0.45*	*<0.01**
4. Other areas applicability	Ag.Sci	59	47	0.32	0.06
	Comm.Arts	*75*	*58*	*0.22*	*0.13*
5. Seeking other suitable strategy	Ag.Sci	45	39	0.62	<0.01*
	Comm.Arts	*66*	*49*	*0.45*	*<0.01**
6. Summarizing lesson	Ag.Sci	56	47	0.38	0.02*
	Comm.Arts	*69*	*54*	*0.41*	*<0.01**
7. Judging how much learned	Ag.Sci	44	53	0.72	<0.01*
	Comm.Arts	*71*	*55*	*0.44*	*<0.01**
8. Assessing correctness of the predictions	Ag.Sci	47	30	0.50	<0.01*
	Comm.Arts	*42*	*44*	*0.39*	*0.01**
9. Comparing new knowledge with known knowledge	Ag.Sci	58	56	0.57	<0.01*
	Comm.Arts	*69*	*58*	*0.40*	*0.01**
10. Judging worthiness of learning	Ag.Sci	62	47	0.62	<0.01*
	Comm.Arts	*67*	*68*	*0.69*	*<0.01**

1 Per cent of students who said they 'often use' or 'always use' the strategy.

* Significant at or beyond the 0.05 level.

As shown in Table 7.10, a strong association between the two sets of ratings in the **Communication Arts** was only found for strategy no. 10 *'judging worthiness of learning'* (*tau-b* = 0.69). The strong association for the relevance of this strategy might be at play here (see Table 7.5). As reported in the interviews, considering whether the information is worthwhile or appropriate is common in Communication Arts tasks, so the students might have learned to regularly assess their learning in both the MSC and English. As with the Agricultural Science students, no significant association was found for strategy 4 *'other area applicability'* and the per cent frequent use figures confirm that Communication Arts students are more likely to use this frequently in learning the MSC than in learning English.

SUMMARY

To examine whether students in the two disciplines carried over their perceptions of relevance of the metacognitive processes, and the use of the individual strategies therein, non parametric measurements of association, that is, *Spearman's Rank Order Correlations (rho)* and *Kendall's tau-b* were employed. The results reveal that overall the students used 10 metacognitive strategies and perceived the relevance of 18 metacognitive strategies for both the MSC and English (high percentages and high *tau-b* coefficients). This shows that although perceived as relevant, some strategies are not being used in learning English. The metacognitive processes perceived as relevant across the two subjects by both the Agricultural Science and Communication Arts students included 2 *Planning*, 7 *Monitoring*, 4 *Problem-solving* and 5 *Evaluating*. The metacognitive strategies these students used for learning both the MSC and English were 1 *Planning*, 5 *Monitoring*, 2 *Problem-solving* and 2 *Evaluating*. More *Monitoring strategies* were transferred than others might be indicative that monitoring is conducive to language learning.

Although a greater per cent agreement and frequent use was found for the Communication Arts, the Agricultural Science students were more consistent in relation to the likelihood of transfer of both perceptions of relevance and use of all four metacognitive processes. Agricultural Science students consistently (with high *tau-b* only) rated the relevance of 14 strategies and used 7 strategies for both the MSC and English while the Communication Arts students consistently rated the relevance of 9 strategies and used 4 strategies. However, the two groups of students differed greatly in transferring the strategies they perceived as relevant or used. The relevance of 5 out of the 18 strategies (1 *Monitoring*, 1 *Problem-solving* and 3 *Evaluating*) and the use of 1 of the 10 metacognitive strategies (a *Problem-solving strategy*) were in common.

The limited availability of English units and therefore few extended study opportunities to enhance the development of metacognitive strategies and improve English proficiency might have caused the lack of transfer of metacognitive strategies. That is, there simply may not have been enough learning opportunities where students would see the strategies as relevant or of use to them. However, whether high level English proficiency actually enhances the ability to transfer metacognitive strategies has not been addressed in this study because students with poor proficiency were selected as participants. These results therefore need to be compared with cohorts of students from the same environment who are highly proficient in English.

Results from self-reports will be presented in the next chapter.

8. METACOGNITIVE STRATEGIES: RESULTS FROM SELF REPORTS

OVERVIEW OF THE CHAPTER

This chapter discusses informants' responses to self-reports. Although the results were not robust, they showed a high role of this chapter in triangulation. Firstly, justification for and details of the measurement system are provided. Then an overview of the analyses of the data follows. Next the findings are presented with respect to the research questions and metacognition theory. The data reveal how students approach learning the MSC and English, as well as providing some evidence on the instructors' incorporation of the strategies in teaching. Aspects of commonality and difference with respect to these findings are described. Finally, a comparative analysis of the students and instructors' views within and across domains is described.

8.1 ELICITATION OF INFORMATION THROUGH SELF REPORTS

In order to elicit knowledge about the perceived relevance of strategies and the strategies actually used in learning the major subject content as well as in learning English, self-reporting appears from the literature to be the data elicitation technique offering the most promise. As the discussion in chapter 2 reveals, self-reporting measures have been the principal technique used in most previous studies to identify strategies maintained in retrospective thought. However, the reliability and validity of these self-report measures need to be justified because subjects might report strategies they do not actually employ (Brown, 1988). Therefore, as suggested by Pintrich and Groot (1990), self-report measures were administered together with other approaches, such as interview guides, survey questionnaires and think-aloud protocols, to help rectify this possible deficit. All these approaches have the same limitation. People can report strategies in the interviews and questionnaires that they do not actually use. By using multiple methods, we can see whether the participants are consistent in their reporting.

To ensure the accessibility of the required data, the participants were requested to provide two self-reports within a month period. They wrote the first report immediately after the first meeting. The second report was provided after they had responded to the other modes of data elicitation. The 39 Agricultural Science informants (34 students and 5 instructors) and 45 informants in Communication Arts (40 students and 5 instructors) provided 168 reports altogether. Separate instructions were prescribed for instructor and student informants. Students were asked to describe how they had learned their major discipline as well as English, particularly in the context of listening to lectures/listening comprehension and in reading materials/reading comprehension[38]. Instructor informants were asked to comment only on the subject(s) they had handled. (The details of this guidance are shown in Appendices 3.11 and 3.12.)

The reports were analysed for the subjects' perceptions and their actual actions with respect to metacognition theory and the research questions. In the next section, a brief description of the analysis is provided, in addition to a brief review of the coding and categorising that has been detailed in Chapter 3. Then the results and the comparative analyses are presented.

8.2 SELF REPORT DATA ANALYSIS

The students' 148 reports were analysed for demonstrated discernment of the relevance of the strategies. The analysis also looked into the consequences of this knowledge such as the use of the strategies. The main focus of the analyses was how they approached learning in the major content area and in English. The instructors' 20 reports were analysed for their perceptions of how students approached major content area knowledge. Data was also collected on how lecturers incorporated learning strategies into their teaching practice.

8.2.1 Coding and Categorising Data

Three stages of a categorisation method adopted from Strauss and Corbin (1990) and Huberman and Miles (1994), as described in chapter 3, were carried out.

Initial coding based on the phenomena arising from the data was carried out using *in vivo* codes. This type of code involves labelling an existing phenomenon in a line-up unit, paragraph and/or a document by using the terms the informant has employed (see details in chapter 3, Tables 3.6 and 3.7). These codes were rather long and descriptive, and included for example, *discussing with friends about the lectures*; *underlining important parts in textbook/hand out*; *present to class what studied; note-taking on important parts*; *learn ways to learn*.

At the second stage, the strategies were categorized under the emerging situations of their use to establish the relations between the codes identified at the initial coding stage. Commonalties and discrepancies were examined. Some codes were replaced by terms that had

[38] The listening in the L1 and in English are different in this study. While listening tasks in L1 or in learning major subject content mainly involve comprehending the information delivered, most listening tasks in English aim at understanding the unfamiliar language. Therefore, the former is called "learning from lectures", the latter "listening comprehension". The same labelling is applied to reading. Reading in the L1 is called "reading related materials" and English reading is "reading comprehension".

theoretical relevance as, for example, where *jotting down a problem* became *recording a problem*, and *study additional information from books in a library* was replaced by *extra readings*. Such terms are commonly used in different literature on learning strategies. The different codes that described similar behaviour were rectified in line with those argued by Chamot and colleagues (1999). Similar codes were then grouped. (Examples are shown in Table 3.8.)

In the final stage, the categories of the codes were refined and validated. Based on the original data, a search for examples of data opposed to those of the established relationships or hierarchy was made. Some codes were renamed. Some deviant codes were put into categories that are more suitable. For instance, the code *'recording a problem*' was found for the strategies exercised in both dealing with a problem and monitoring listening or reading. Consequently, the code was put under *Monitoring* process as *'detecting weaknesses/obstacles'* (for further details see Table 3.9). This is because the activities took place while the informants were monitoring the on-going task.

Sometimes the same strategies were employed to tackle different tasks in different situations. Therefore, they appeared in different categories of learning strategies. For instance, *consulting a dictionary* arose both in *Planning* process and in *Problem-solving* process. Results are described in the following sections.

8.2.2 Analysis of Self reports on Learning Strategies

In the 168 reports, each informant in the respective disciplines was asked to reflect on their understanding about the learning tasks, about themselves as either learners or lecturers, and about the strategies. Although results from the self reports are not robust compared to the questionnaires, they support Hallbach's (2000) argument that this approach provides insight into informants' knowledge and strategy use. The low results collected from self reports are expected as this has been reported as a limitation of this approach in previous literature (such as in Hallbach, 2000; McDonough, 1995). The data show that, based on received weaknesses, difficulties, obstacles and/or failures, and attitudes and/or beliefs, the tasks and strategies informants described were either emotional or behavioural or both. This supports metacognition theory that involves knowledge about one's own cognitive and affective conditions as well as the control and regulation of that knowledge (details in chapter 2 section 2.2).

The presentation of the strategies found in self reports, according to the Metacognitive processes proposed by Chamot, Barnhardt, El-Dinary, & Robbins (1999), consists of the processes of *Planning, Monitoring, Problem-solving* and *Evaluating*. The strategies of these four processes are presented in two learning contexts; including learning the major subject content (MSC) (section 8.3-8.5) and learning English (section 8.6-8.7). It is noteworthy that a greater number of individual strategies for each process were found in the self-reports, e.g., 23 *Planning,* 12 *Monitoring,* 34 *Problem-solving* and 16 *Evaluating* for both MSC and English. Some pre-selected strategies in the questionnaires, *Monitoring* and *Evaluating* in particular, were also mentioned in the self-reports.

To find out if there was any relationship between the phenomena, four comparative analyses were carried out. The first two considered whether (i) the students' use of strategies and (ii) the instructors' incorporation of strategies into their teaching related to their perceptions of strategy relevance. The next two analyses considered whether there were any links between (iii) instructors' perceptions of relevance and students' perceptions and use of the strategies as well as (iv) instructors' incorporation of strategies and students' use.

In response to the research questions, which centred on metacognition theory, data are presented according to the two main categories of learning the major subject content (MSC) and in learning English. The results of the self-reports are then divided into how students approach learning from lectures/listening comprehension and reading related materials/reading comprehension. Figure 8.1 illustrates the presentation of the results.

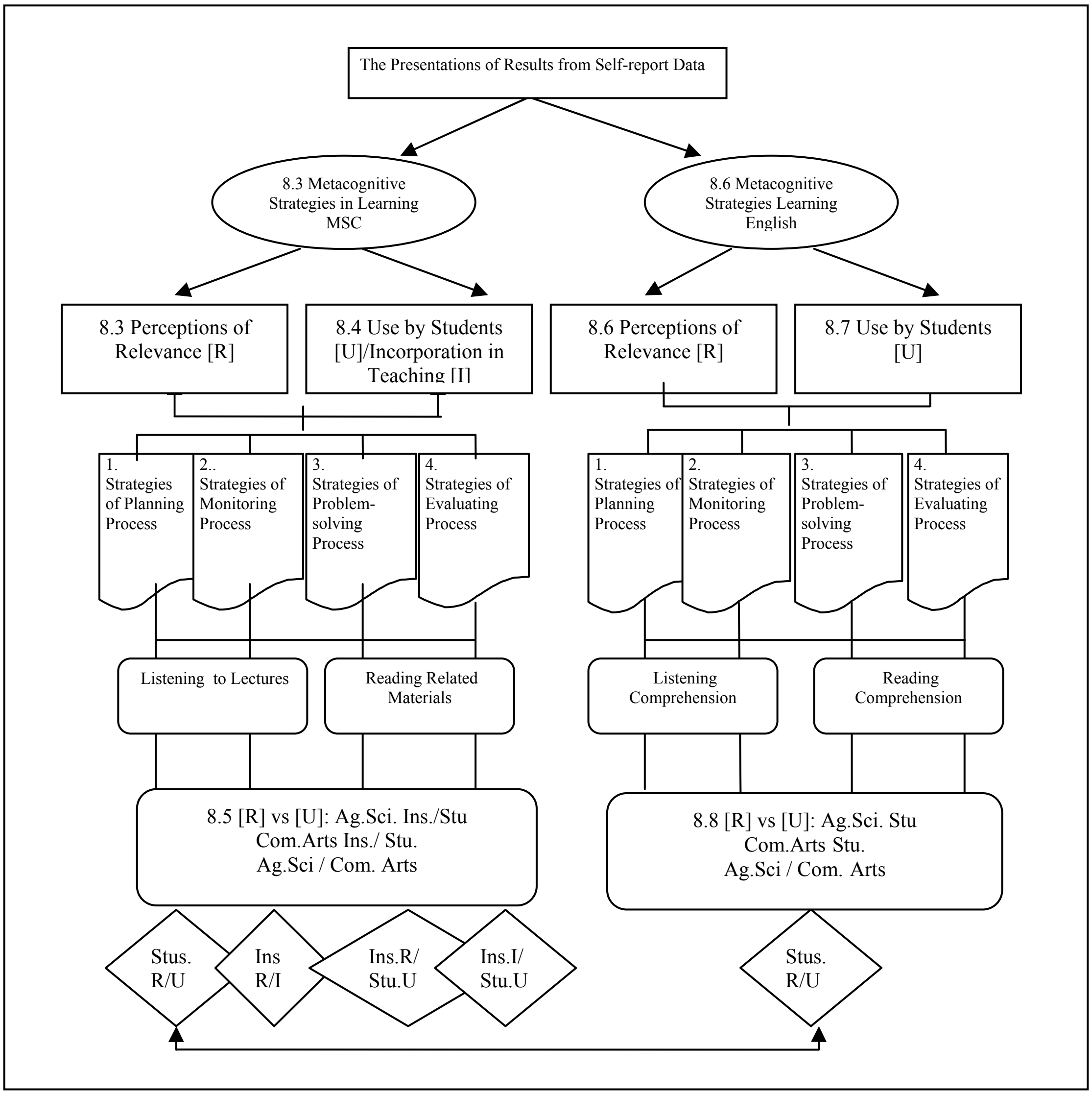

Figure 8.1 Presentation of results from the self reports.

8.3 MSC: PERCEIVED RELEVANCE

In order to elicit the informants' knowledge about effective ways to learn as well as the use of strategies both in listening to lectures/listening comprehension and in reading, students were asked to write about how they approach these activities in learning their discipline subject and English (see Appendix 3.11). The instructors were asked to provide information only on the subject(s) they had been in charge of (see Appendix 3.12). Recognition of either the appropriateness/advantage of a particular action or the inappropriateness/disadvantage of not doing that action is coded perceived relevance. What informants reported actually doing is categorised as use by students or incorporation in teaching by instructors. The following excerpt provides examples of the perceived relevance of *Planning strategies*.

> It helped to give me deeper understanding [PERCEIVED RELEVANCE/ READING: PRE-REVIEWING THE NOTES]. I always read 2-3 times in order to be able to recognize important ideas, technical terms, and tactics in career practice [USE BY STUDENTS/READING: RE-READING]; [PERCEIVED RELEVANCE/READING: RE-READING][39].

Some examples of relevance of a *Planning strategy* and its incorporation in teaching by instructor are extracted from the following excerpt.

> 'The Principles of Plant Science' was one of the units which I handled. I focused on both theory and practice. I provided a textbook for learners by gathering information from various materials. In teaching, I guided students through the practical content, in giving the background knowledge, so they could use it for learning other subjects [PERCEIVED RELEVANCE: LINKING WITH PRIOR KNOWLEDGE][40].

Strategies of each Metacognitive process (*Planning, Monitoring, Problem-solving, Evaluating*) are presented separately in sections 8.3.1 - 8.3.4 respectively. Each section identifies strategies involved in the two different learning contexts, namely learning from lectures and reading related materials.

8.3.1 Planning Strategies: Relevance to listening & reading

As seen in Table 8.1 below, in the **Agricultural Science** content area, the informants (instructors & students) perceived the relevance of 14 *Planning strategies*. Only 9 of strategies were perceived as relevant for **listening to lectures** by 12 per cent of students or less.

Informants (instructors & students) in the **Communication Arts** content area perceived the relevance of 15 *Planning strategies*. Interestingly, there was no evidence of agreement between instructors and students in this field. For example, no lecturers perceived strategy no. 9 *'preparing for class'* as relevant, yet 27 per cent of their students did. It is also somewhat surprising that lecturers did not mention the relevance of strategy no. 4 *'pre-reviewing concepts'*, while 25 per cent of their students did. No evidence of the relevance of strategy 9 came up in the interviews or the questionnaires, but *'pre-reviewing concepts'* (strategy 4) was mentioned in the interviews which the Communication Arts instructors identified as involving studying theory, language and different TV/radio programmes, while students gave details of studying the previous lessons or notes.

[39] This strategy description also provides evidence of 'use' so it would be scored for use by students also.
[40] This strategy description also provides evidence of 'incorporation in teaching' so it would be scored for incorporation in teaching by instructors, too.

Table 8.1 STUDENTS vs INSTRUCTORS- Perceived relevance of planning strategies in learning MSC

Planning Strategies	Perceptions of Relevance (%)					
	Ag.Sci			CA		
	Ins[1] (N=5)	Stu (N=34)[2] Listening	Stu (N=34)[2] *Reading*	Ins[1] (N=5)	Stu (N=40)[2] Listening	Stu (N=40)[2] *Reading*
1. Goal setting	**20**	0	***3***	**20**	0	***0***
2. Directing attention selectively	**20**	0	***0***	**0**	5	***0***
3. Linking with prior knowledge	**40**	9	***0***	**0**	0	***0***
4. Pre-reviewing concepts	**40**	3	***0***	**0**	25	***0***
5. Accessing various resources	**40**	0	***0***	**60**	0	***0***
6. Preparing to confront obstacles	**20**	6	***0***	**40**	0	***0***
7. Making a plan	**0**	0	***0***	**40**	0	***3***
8. Choosing strategies for the task	**0**	0	***0***	**0**	5	***0***
9. Preparing for class	**20**	12	***0***	**0**	27	***0***
10. Making a timeframe	**20**	0	***0***	**20**	0	***0***
11. Extra reading	**20**	0	***0***	**0**	0	***0***
12. Spending extra time to study/practice	**40**	6	***0***	**20**	0	***0***
13. Pre-reading[3]	**0**	12	***0***	**0**	8	***0***
14. Suppressing distractions/inappropriate thoughts	**0**	0	***0***	**0**	3	***0***
15. Arriving class on time	**0**	9	***0***	**0**	5	***0***
16. Selecting a seat	**0**	3	***0***	**0**	8	***0***
17. Effort directed	**0**	3	***0***	**0**	0	***0***
18. Intending to concentrate in class	**0**	0	***0***	**0**	3	***0***

1 Instructors were asked to write about learning in general.

2 Informants were asked to write about listening and reading separately.

3 Pre-reading is a listening strategy-linking, not a reading strategy.

No more than 27 per cent of the Communication Arts students reported the relevance of any one strategy. Even fewer Agricultural Science students gave responses on perceived relevance of strategies. Instructors in the Communication Arts saw relevance in *'making a plan'* (no. 7) which Agricultural Science instructors did not. This result is consistent with the interview data where instructors in Communication Arts showed more concern about planning for work/study by reporting both the relevance and the inclusion of strategies such as *sequencing the work, making a plan, making a timeframe* and *following the plan*.

There was evidence of agreement between instructors and students only in Agricultural Sciences for the relevance of *Planning* strategies (nos. 3, 4, 6, 9 and 12), although this was not strong.

There was low level reference to **reading** in spite of students' reference on listening and this is concerning because students either do not do much reading or do not value it as a learning exercise.

8.3.2 Monitoring Strategies: Relevance to listening & reading

A limited number of *Monitoring strategies* were reported in the respective disciplines. Only one instructor in **Agricultural Sciences** perceived the *comprehension check* and *checking progress* strategies as appropriate for learning the MSC. A few Agricultural Science **students** (9 per cent) perceived the relevance of *note taking* to **listening to lectures** but only one student perceived it as relevant for **reading related materials**.

No **Communication Arts** instructors showed awareness of these strategies in the self-reports. The relevance of a *note taking* was recorded by 28 per cent of Communication Arts students for **listening to lectures** and 8 per cent **for reading related materials**. Only one student recognised the relevance of the *comprehension check* strategy when reading related materials.

8.3.3 Problem-solving Strategies: Relevance to listening & reading

In contrast to *Monitoring*, there were 23 *Problem-solving strategies* recorded as relevant. The problem-solving process was the most frequently mentioned metacognitive in self-reports. Table 8.2 (below) shows these details.

Agricultural Science **lecturers** perceived the relevance of six strategies (nos. 1, 2, 6 and 9), all of which were also seen as relevant by Communication Arts lecturers. Communication Arts lecturers on the other hand perceived many more *Problem-solving strategies* as relevant, than did their students. This might be because of the difference of experience instructors and students have. This finding is consistent with the evidence found in some Communication Arts instructors' interview scripts.

Agricultural Science students were more likely to perceive strategies 6, 9, 13 and 18 as relevant when **listening to the MSC lectures**. Of these, only strategy no. 9 *'suppressing inappropriate thoughts/distractions'* and no. 18 *'responding in class'* were deemed relevant by their lecturers. Lectureres also placed importance on nos. 2, 3, 11 and 22.

Table 8.2 STUDENTS vs INSTRUCTORS- Perceived relevance of problem-solving strategies learning MSC

Problem-solving Strategies	Perceptions of Relevance (%)					
	Ag.Sci			CA		
	Ins[1] (N=5)	Stu (N=34)[2] Listening	Stu (N=34)[2] *Reading*	Ins[1] (N=5)	Stu (N=40)[2] Listening	Stu (N=40)[2] *Reading*
1. Asking for clarification	**0**	6	***3***	**0**	3	***0***
2. Linking with prior knowledge	**60**	3	***0***	**20**	3	***0***
3. Seeking peer support	**20**	0	***0***	**20**	5	***3***
4. Trying alternatives	**0**	0	***0***	**40**	0	***0***
5. Effort directed	**0**	0	***3***	**0**	5	***3***
6. Concentration in class	**0**	35	***3***	**40**	15	***3***
7. Trying to figure out main ideas	**0**	0	***0***	**0**	3	***5***
8. Doing nothing	**0**	3	***0***	**0**	0	***0***
9. Suppressing distractions/inappropriate thoughts	**80**	50	***0***	**60**	10	***0***
10. Asking for help	**0**	3	***0***	**0**	3	***0***
11. Looking for solutions	**20**	3	***0***	**20**	3	***0***
12. Reviewing the lessons/notes	**0**	6	***0***	**0**	13	***5***
13. Extra reading	**0**	13	***0***	**20**	32	***8***
14. Trying to resume concentration	**0**	3	***0***	**0**	0	***0***
15. Memorising words	**0**	3	***9***	**0**	0	***0***
16. Spending extra time to study/practice	**0**	3	***3***	**40**	3	***3***
17. Solving it alone	**0**	0	***0***	**20**	0	***0***
18. Responding in class	**40**	12	***0***	**40**	10	***0***
19. Making understanding clear	**0**	0	***0***	**40**	3	***3***
20. Re-reading*	**0**	0	***6***	**0**	0	***3***
21. Discussing the problems	**0**	3	***0***	**20**	5	***0***
22. Consulting the instructor	**20**	0	***0***	**40**	3	***3***
23. Working it out in a group	**0**	0	***0***	**20**	0	***0***

1. Instructors were asked to write about learning in general.
2 Informants were asked to write about listening and reading separately.
3 Pre-reading is a listening strategy-linking, not a reading strategy.
* Some of those who employed *re-reading* defined the strategy as selectively repeating the reading of the important parts of the text

By contrast, **Communication Arts** students saw strategies 6, 9, 12, 13 and 18 as the more relevant. These students placed most importance on strategy no. 13 *'extra reading'* (32 per cent). Thus the students in the two disciplines were quite similar in their reporting of relevant strategies. Communication Arts lecturers noted the relevance of many more strategies than their students suggesting that lecturers are not adequately transferring this knowledge to students.

Mention of *Problem-solving strategies* for **reading** the MSC was limited and therefore does not contribute strongly to the findings.

8.3.4 Evaluating Strategies: Relevance to listening & reading

A limited number of *Evaluating strategies* came up in the two disciplines (see Table 8.3). There were very low numbers of instructors and students who reported these strategies as relevant and they were only for **listening to lectures**. Instructors in Agricultural Sciences reported importance of more strategies than Communication Arts instructors. Students' responses were limited from both disciplines. Although the proportion of responses is different, these findings are consistent with the findings from the questionnaires that there was different between instructors' and students' opinions (see Table 5.10). For example, while Agricultural Science instructors tended to see the relevance of more *Evaluating strategies* than did their students Communication Arts students saw the relevance of more strategies than their instructors.

Table 8.3 STUDENTS vs INSTRUCTORS- Perceived relevance of evaluating strategies learning MSC

Evaluating Strategies	**Perceptions of Relevance (%)**					
	Ag.Sci			**CA**		
	Ins[1] (N=5)	**Stu (N=34)[2]**		**Ins[1] (N=5)**	**Stu (N=40)[2]**	
		Listening	***Reading***		Listening	***Reading***
1. Judging that the goal has been met	**0**	0	***0***	**20**	0	***0***
2. Assessing strategy use	**20**	0	***0***	**0**	0	***0***
3. Summarising ideas/lessons	**40**	0	***0***	**20**	5	***0***
4. Judging how much learned	**0**	0	***0***	**0**	3	***0***
5. Judging worthiness of learning	**0**	0	***0***	**0**	3	***0***
6. Assessing learning/work	**20**	0	***0***	**20**	0	***0***
7. Assessing knowledge/information	**20**	3	***0***	**0**	5	***0***
8. Applying learning to practice	**20**	3	***0***	**0**	0	***0***

1. Instructors were asked to write about learning in general.
2 Informants were asked to write about listening and reading separately.
3 Pre-reading is a listening strategy-linking, not a reading strategy.

8.4 MSC: USE BY STUDENTS & INCORPORATION IN TEACHING

In previous chapters, use by students and incorporation in teaching were located separately. For the purposes of brevity, they are presented in one section this chapter. This section reports on both the students' actual use of metacognitive strategies, and the incorporation of metacognitive strategies into teaching the MSC by instructors. While students were requested to describe their thoughts and learning habits in listening and reading tasks separately, instructors in **the given disciplines** were not requested to relate their self-reports to specific learning tasks. Even though it is problematic to report the influence of instructors' views on the use of strategies, the high acceptance of lecturers' authority among Thai students (as discussed in chapter 2) allows a tentative conclusion. Whether the students' use of metacognitive strategies related to the instructors' incorporation in teaching was examined by comparing the per cent use to per cent incorporation in teaching.

8.4.1 Planning Strategies in listening & reading: Use by Students, Incorporation in Teaching

Use by Students

As shown in Table 8.4 below, collectively, **Agricultural Science** students claimed to employ fifteen *Planning* strategies when **listening to the MSC lectures**. Strategies nos. 2 *'directing attention selectively',* 4 '*pre-reviewing concepts*', 10 *'preparing for class',* 14 *'pre-reading'* and 16 *'arriving class on time'* were the most widely used.

Communication Arts students mentioned sixteen strategies for planning in their self-reports. Strategy no. 4 was noted by 40 per cent of the students. Strategies 10 *'preparing for class'* and 14 *'pre-reading'* attracted over 20 per cent of responses. Other less frequently used strategies were 2 and 9.

Students in the two disciplines showed substantial agreement on the use of *Planning* strategies when listening to MSC lectures. Not only did they agree on the number and types of strategies used, but also with the levels of agreement. The predominant strategies used by students in both fields were nos. 2, 4 and 14. The more frequent use of the *Planning* process among Communication Arts students was also found in the questionnaires (see Table 5.11 and 5.12).

The **reading** context was also mentioned concerning the use of *Planning strategies*. Agricultural Science students noted no. 1 *'goal setting'* and no. 21 *''intending to concentrate in class'* as used to reading in the MSC. Communication Arts students also reported on the use of no. 1 (18 per cent) and no. 9 *'choosing strategy for the task'* (13 per cent) for reading in the MSC.

Table 8.4 STUDENTS' Use & INSTRUCTORS' Incorporation of planning strategies in learning MSC

Planning Strategies	Use by Students/Incorporation in Teaching (%)					
	Ag.Sci			CA		
	Ins[1] (N=5)	Stu (N=34)[2] Listening	*Reading*	Ins[1] (N=5)	Stu (N=40)[2] Listening	*Reading*
1. Goal setting	**40**	6	***15***	**40**	0	***18***
2. Directing attention selectively	**20**	18	***6***	**20**	17	***8***
3. Linking with prior knowledge	**60**	6	***0***	**40**	8	***0***
4. Pre-reviewing concepts	**80**	29	***0***	**40**	40	***0***
5. Accessing various resources	**80**	3	***3***	**100**	3	***0***
6. Preparing to confront obstacles	**20**	6	***0***	**40**	5	***0***
7. Predicting outcomes/answers	**20**	3	***0***	**0**	3	***0***
8. Making a plan	**40**	0	***0***	**60**	0	***3***
9. Choosing strategies for the task	**0**	0	***3***	**20**	15	***13***
10.Preparing for class	**60**	12	***0***	**40**	27	***0***
11. Making a timeframe	**20**	0	***0***	**40**	0	***0***
12. Extra reading	**40**	3	***0***	**20**	0	***0***
13. Spending extra time to study/practice	**20**	6	***0***	**60**	0	***0***
14. Pre-reading	**0**	29	***0***	**0**	23	***3***
15. Suppressing distractions/inappropriate thoughts	**0**	0	***0***	**0**	3	***0***
16. Arriving class on time	**0**	15	***0***	**0**	10	***0***
17. Selecting a seat	**0**	6	***0***	**0**	10	***0***
18. Effort directed	**0**	0	***0***	**20**	5	***3***
19. Thinking in advance/discussing about the topic	**0**	3	***0***	**0**	10	***0***
20. Predicting the encountered problem	**0**	3	***0***	**0**	3	***0***
21. Intending to concentrate in class	**0**	0	***12***	**0**	5	***8***

1. Instructors were asked to write about learning in general.
2 Informants were asked to write about listening and reading separately.
3 Pre-reading is a listening strategy-linking, not a reading strategy.

Incorporation in Teaching

Lecturers of the MSC in either discipline embedded *planning strategies* in teaching. As Table 8.4 shows, **both** Agricultural Science and Communication Arts lecturers incorporated a broad range of strategies in their teaching. The most widely taught strategy by both groups of lecturers was no. 5 *'accessing various resources'*. Interestingly, Communication Arts instructors did not mention, e.g., strategies 7 and 20 in self reports, they rated them regularly in the questionnaires.

Incorporation in Teaching vs Use by Students

Many more strategies were reported by **Agricultural Science** lecturers as used in their lectures than were used by students (see Table 8.4). Only three of these, i.e., nos, 2, 4 and 9, were reported as used by students, suggesting little transfer of instruction into practice among students. Students used some strategies, particularly strategies 14 *'pre-reading'* and 16 *'arriving class on time'*, but no instructors mentioned them in the self reports suggesting that independent of appropriate strategies. *Reading before class* was also mentioned in the interviews while *arriving before a class begins* is a requirement of every class.

Although strategy use was relatively strong in this data for **Communication Arts** students, little of it reflected what lecturers were incorporating in their lectures, which also suggests some independence in the students' learning. This discrepancy also came up in their responses to the questionnaires (see Table 5.36).

Given a greater number of strategies compared with those perceived relevant (see also Table 8.1), particularly for Communication Arts, students may have been influenced more by what they perceived as relevant, than by what was incorporated into the teaching.

8.4.2 Monitoring Strategies in listening& reading: Use by Students & Incorporating in Teaching

Reports on the use of *Monitoring strategies* presented more robust findings from students than the *Planning* or *Problem-solving*.

Use by Students

A striking number of students in **both fields** (85 per cent Agricultural Science; 73 per cent Communication Arts) reported the use of strategy no. 3 *'detecting weaknesses/obstacles'* (see Table 8.5 below). Strategies 1 *'comprehension check',* 2 *'checking progress'* and 11 *'self-examination'* were used by a similar number of students in the two groups. There was also some similarity influence of strategies 4, 5, 9 and 12, but this was not as robust. For example, strategy 10 *'note taking'* attracted a strong response from Communication Arts students (73 per cent) but less than half of Agricultural Science students used it (44 per cent). Conversely, more than half the students in Agricultural Sciences used strategy 6 *'checking the attention'* (56 per cent) while fewer students in Communication Arts (38 per cent) used it. Contrary to this table, the findings from the questionnaires showed that more than half the students in Communication Arts rated frequent use of strategy 7 *'checking the appropriateness of the strategy being used'* and about half the students in Agricultural Sciences rated frequent use of strategy 8 *'checking* *importance of the information'* (see Table 5.38). However, the fact that some students may have forgotten to mention some strategies in their self reports cannot be ignored.

Table 8.5 STUDENTS vs INSTRUCTORS- Use/ Incorporation of monitoring processes in learning MSC

Monitoring Strategies	Use by Students/Incorporation in Teaching (%)					
	Ag.Sci			CA		
	Ins[1] (N=5)	Stu (N=34)[2] Listening	Stu (N=34)[2] *Reading*	Ins[1] (N=5)	Stu (N=40)[2] Listening	Stu (N=40)[2] *Reading*
1. Comprehension check	**80**	41	***15***	**40**	45	***23***
2. Checking progress	**60**	18	***0***	**80**	13	***0***
3. Detecting weaknesses/obstacle	**40**	85	***15***	**80**	73	***25***
4. Seeking related prior knowledge	**0**	3	***0***	**0**	3	***0***
5. Checking the retrieval of required information	**0**	3	***0***	**0**	3	***3***
6. Checking the attention	**60**	56	***6***	**40**	38	***8***
7. Checking appropriateness of the strategy being used	**0**	3	***0***	**40**	0	***0***
8. Checking importance of the information	**0**	0	***0***	**0**	3	***0***
9. Checking correctness of the predictions	**0**	6	***0***	**0**	3	***0***
10. Note taking, i.e., new words, important/ interesting parts	**0**	44	***3***	**0**	73	***20***
11. Self-examination	**0**	29	***0***	**20**	23	***3***
12. Distinguishing inappropriateness from appropriateness	**0**	3	***0***	**0**	5	***0***

1. Instructors were asked to write about learning in general.
2 Informants were asked to write about listening and reading separately.
3 Pre-reading is a listening strategy-linking, not a reading strategy.

Monitoring strategies use when **reading** the MSC was also mentioned in the self reports. Both Agricultural Sciences and Communication Arts reported using *Monitoring* strategy no. 1 *'comprehension check'*, 2 *'detecting weaknesses/obstacles'* and 6 *'checking the attention'*. However, more Communication Arts reported this usage. Some 20 per cent of Communication Arts students claimed to use strategy no. 10 '*note taking'*.

Incorporation in Teaching

Overall, lecturers in **these two fields** were similar in their incorporation of strategy, in particular nos. 1, 2, 3 and 6. One Communication Arts instructor also included no. 11 *'self-examination'* that may also have been replaced in students' listening strategy use.

8.4.3 Problem-solving Strategies in listening & reading: Use by students, Incorporation in Teaching

Use by Students

The most commonly mentioned strategies among **Agricultural Science** students were nos. 11 *'concentration in class'* (44 per cent), 23 '*solving a problem alone*' (47 per cent) and 24 *'responding in class'* (41 per cent) (in Table 8.6 below). They were noted by more than 40 per cent of students. Students mentioned the use of a further 25 strategies. Noted additional strategies included nos. 13 '*do nothing*' (26 per cent), 14 *'suppressing distractions/ inappropriate thoughts'* (26 per cent) and 18 *'extra reading'* (21 per cent).

As in the case of the Agricultural Sciences, students in **Communication Arts** reported the use of a wide variety of *Problem-solving strategies* – 21 in total. The most commonly used strategy was also no. 11 (63 per cent). Other commonly used strategies for these students were nos. 5 *'seeking peer support'* (40 per cent), 12 *'trying to figure out main ideas'* (43 per cent), 17 *'reviewing the lessons/notes'* (45 per cent) and 18 *'extra reading'* (33 per cent).

The use of *Problem-solving strategies* by students in the two fields was different. While students in Agricultural Sciences either dealt with a problem by themselves (i.e., no. 23) or used avoidance strategies, e.g., they *'did nothing'* (no. 13) or *'gave up'* trying (no.28), most of their Communication Arts counterparts used strategies that relied on other agents. For instance strategy no. 4 *'asking for clarification'* (28 per cent), no. 5 *'seeking peer support'* (40 per cent) and no. 6 *'consulting the instructor'* (15 per cent). This result was also found in the questionnaires (see section 5.4.4).

As shown in Table 8.6 below, there was some reference to the use of *Problem-solving strategies* when **reading** in the self reports by **Communication Arts** students. These students showed that they relied on other agents, e.g., peers (nos. 3 & 5), other resources (no. 1) and lecturers (no. 29). Again the greater use of reading strategies by Communication Arts students supports the findings from the questionnaires (see section 5.9.4). More than half of the strategies the Communication Arts students reported for reading were not incorporated into teaching by their instructors showing that students used for more *Problem-solving strategies* than they had learned in class.

Table 8.6 STUDENTS' Use & INSTRUCTORS' Incorporation of problem-solving strategies in learning MSC

Problem-solving Strategies	Use by Students/Incorporation in Teaching (%)					
	Ag.Sci			CA		
	Ins[1] (N=5)	Stu (N=34)[2] Listening	Stu (N=34)[2] *Reading*	Ins[1] (N=5)	Stu (N=40)[2] Listening	Stu (N=40)[2] *Reading*
1. Accessing various resources	**40**	0	***6***	**60**	0	***18***
2. Ignoring problems	**0**	9	***0***	**0**	0	***0***
3. Asking for clarification	**0**	15	***3***	**40**	28	***3***
4. Linking with prior knowledge	**20**	6	***0***	**20**	8	***0***
5. Seeking peer support	**0**	18	***0***	**0**	40	***13***
6. Trying alternatives	**0**	0	***3***	**40**	0	***0***
7. Making guesses	**20**	0	***0***	**0**	0	***0***
8. Logic reasoning	**0**	0	***0***	**20**	0	***0***
9. Self-encouragement	**0**	9	***3***	**0**	3	***5***
10. Effort directed	**20**	9	***3***	**0**	13	***3***
11. Concentration in class	**0**	44	***3***	**0**	63	***13***
12. Trying to figure out main ideas	**20**	12	***3***	**20**	43	***20***
13. Doing nothing	**0**	26	***0***	**0**	8	***0***
14. Suppressing distractions/inappropriate thoughts	**0**	26	***3***	**0**	18	***3***
15. Asking for help	**20**	9	***0***	**20**	3	***0***
16. Looking for solutions	**20**	3	***0***	**40**	3	***0***
17. Reviewing the lessons/notes	**20**	18	***9***	**0**	45	***13***
18. Extra reading	**60**	21	***3***	**20**	33	***8***
19. Trying to resume concentration	**0**	18	***3***	**0**	8	***0***
20. Memorising words	**0**	3	***9***	**0**	3	***8***
21. Spending extra time to study/practice	**40**	3	***3***	**20**	3	***0***
22. Directing attention selectively	**0**	3	***0***	**0**	0	***5***
23. Solving it alone	**0**	47	***0***	**40**	10	***8***
24. Responding in class	**80**	41	***0***	**40**	28	***0***
25. Making understanding clear	**0**	3	***3***	**40**	28	***13***
26. Re-reading/listening repeatedly	**0**	6	***9***	**0**	0	***10***
27. Discussing the problems/lectures	**20**	3	***0***	**60**	25	***0***
28. Giving up	**0**	15	***0***	**0**	0	***0***
29. Consulting the instructor	**20**	3	***0***	**60**	15	***5***
30. Working it out in a group	**0**	0	***0***	**40**	0	***0***
31. Adjusting techniques/methods	**0**	0	***0***	**20**	0	***0***

1. Instructors were asked to write about learning in general.
2 Informants were asked to write about listening and reading separately.
3 Pre-reading is a listening strategy-linking, not a reading strategy.

Incorporation in Teaching

Thirteen strategies received responses from the instructors in the **Agricultural Sciences** (see Table 8.6). Strategy no. 24, *'responding in class'* was incorporated into teaching by most instructors in this domain (n = 4). Instructors in **Communication Arts** claimed to model 17 *Problem-solving strategies*. The strategies that most instructors (n = 3) included in their lectures were nos. 1 *'accessing various resource'*, 27 *'discussing the problems/lectures'* and 29 *'consulting the instructor'*.

There were differences in the number and frequency of strategies between **the two disciplines**. Communication Arts instructors incorporated a considerably larger number of strategies in their teaching than their Agricultural Science colleagues.

Incorporation in Teaching vs Use by Students

Only two of the thirteen *Problem-solving strategies* (nos. 1 and 7 in Table 8.6) incorporated into teaching by instructors were not used by students in **Agricultural Sciences,** indicating some relationship between the incorporation of these strategies in teaching and their use. But students also used numerous other strategies that were not incorporated in teaching, indicating that these students also used the strategies independently of their instructors' advice.

There were five strategies (nos. 1, 6, 8, 16, 30 and 31) that instructors in **Communication Arts** incorporated into lectures and that students did not use. In addition, students used other strategies more often, indicating a rather weak link between lecturers' incorporation of strategies into teaching and students' use. This may show a degree of ingenuity on the part of the students in that they do not necessarily rely solely on their lecturers to guide their learning, but instead develop strategies independently. This contradicts the strong relationship found between the instructors and students in section 5.9.4. The overall greater number of additional strategies reported here compared with the questionnaires might explain this inconsistency.

8.4.4 Evaluating Strategies in listening and reading: Use by students vs Incorporation in Teaching

As seen in Table 8.7 below, more than 70 per cent of **Agricultural Science** students reported using *Evaluating strategy* no. 11 *'self-assessment'* and no. 13 *'detecting failure/ weaknesses/problems'*. Other highly used strategies were nos. 2 *'assessing strategy use'* (62 per cent) and 12 *'assessing learning/work'* (68 per cent). Some 32 per cent used strategy no. 7 *'judging how much learned',* 20 per cent mentioned strategy no. 6 *'summarising ideas/lessons'*, while 18 per cent claimed to use strategy no 14 *'assessing knowledge/information'*. The strategy use among **Communication Arts** students was similar. However, the most common strategy in this field was no. 12 *'assessing learning/work'* and like the Agricultural Science students, Communication Arts students frequently used nos. 2, 11 and 13. Other popular strategies were nos. 6, 7, 10 *'judging worthiness of learning'* and 14.

Table 8.7 STUDENTS' Use & INSTRUCTORS' Incorporation of evaluating strategies in learning MSC

Evaluating Strategies	Use by Students/Incorporation in Teaching (%)					
	Ag.Sci			CA		
	Ins[1] (N=5)	Stu (N=34)[2] Listening	Stu (N=34)[2] *Reading*	Ins[1] (N=5)	Stu (N=40)[2] Listening	Stu (N=40)[2] *Reading*
1. Judging that the goal has been met	**0**	0	***0***	**20**	8	***3***
2. Assessing strategy use	**60**	62	***6***	**60**	43	***15***
3. Within subject applicability	**0**	3	***0***	**20**	5	***3***
4. Other area applicability	**0**	5	***0***	**40**	3	***3***
5. Seeking other suitable strategy	**0**	3	***0***	**20**	0	***0***
6. Summarising ideas/lessons	**80**	20	***3***	**40**	22	***10***
7. Judging how much learned	**60**	32	***3***	**60**	33	***18***
8. Assessing correctness of the predictions/answers	**0**	6	***0***	**0**	0	***3***
9. Comparing new knowledge with known knowledge	**20**	3	***0***	**0**	3	***0***
10. Judging worthiness of learning	**0**	9	***0***	**0**	25	***5***
11. Self-assessment	**0**	76	***6***	**20**	55	***15***
12. Assessing learning/work	**80**	68	***0***	**80**	73	***3***
13. Detecting failure/ weaknesses/ problems	**0**	71	***6***	**20**	68	***18***
14. Assessing knowledge/information	**60**	18	***0***	**40**	25	***10***
15. Refining ideas/skills	**0**	5	***0***	**0**	8	***3***
16. Applying learning to practice	**80**	3	***0***	**80**	5	***0***

1. Instructors were asked to write about learning in general.
2 Informants were asked to write about listening and reading separately.
3 Pre-reading is a listening strategy-linking, not a reading strategy.

As shown in Table 8.7, some **Communication Arts** students (18 per cent and less) provided information on the use of 13 *Evaluating strategies* in **reading** L1 materials. The most frequently used strategies for reading, reported by these students are nos. 2 *'assessing strategy use',* 6 *'summarising ideas/lessons',* 7 *'judging how much learned',* 11 *'self-assessment',* 13 *'detecting failure/weaknesses/problems'* and 14 *'assessing knowledge/information'*. This suggests that these metacognitive strategies are inductive for reading.

Agricultural Science students only minimally reported the use of *Evaluating strategies* for reading.

Incorporation in Teaching vs Use by Students

There was evidence of some agreement between **Agricultural Science** students' use of the *Evaluating* strategies and instructors' incorporation in teaching, e.g., 2 *'assessing strategy use',* 12 *'assessing learning/work'*. However, the low use of strategies 6 and 16, despite a high incorporation in lectures, and the fact that a lot of students used other strategies (e.g., nos. 11 *'self-assessment'* and 13 *'detecting failure/weaknesses/problems'*), which were not included in lectures suggests a degree of independent learning.

There was more apparent evidence of the relationship between instructors and students in the **Communication Arts**, particularly for no. 12 *'assessing learning/work'*. Other strategies also showed some usage and inclusion in lectures, e.g., nos. 2, 6, 7, 14 and to a lesser extend nos. 11 and 13. Interestingly, strategy 16 *'applying learning to practice'* was incorporated in teaching by most lecturers but rarely reported as used by students. These findings were also found in the interviews (see section 4.8.4) and the questionnaires (see section 5.9.5).

8.5 MSC: PERCEIVED RELEVANCE vs USE/INCORPORATION

In this section a comparison is made of perceptions of the relevance of metacognitive strategies and (i) their incorporation in teaching by lecturers and (ii) their use by students.

8.5.1 Planning Strategies in listening & reading: Perceived Relevance, Incorporation in Teaching, Use by Students

Relevance to Instructors vs Incorporation in Teaching

In Table 8.8 below, overall, evidence of a relationship between the perceived relevance of strategies and their incorporation of strategies in teaching is more vigorous in the Agricultural Sciences than in the Communication Arts. Lecturers from **both fields** perceived the relevance of, and included in their teaching, five strategies (nos. 1, 5, 6, 11 and 13). Instructors in the Agricultural Sciences reported incorporation of another five strategies that they perceived as relevant (nos. 2, 3, 4, 10 and 12) while Communication Arts lecturers reported both the relevance and incorporation of only one additional strategy (no. 8 *'making a plan'*). Some strategies were included in teaching although not seen as relevant, for example, nos. 7 and 8 by Agricultural Science instructors and nos. 2, 3, 4, 9, 10, 12 and 18 by Communication Arts instructors. This supports the stronger associations between the Agricultural Science instructors' ratings of perceived relevance and incorporation that came up in the questionnaires (see Table 5.26 section 5.7.1).

Table 8.8 STUDENTS & INSTRUCTORS– Perceived relevance (R) vs Incorporation (I)/Use (U) of planning strategies in MSC.

Planning Strategies		Ag.Sci (%) Ins (N=5)	Ag.Sci (%) Stu (N=34) Listening	Ag.Sci (%) Stu (N=34) *Reading*	CA (%) Ins (N=5)	CA (%) Stu (N=40) Listening	CA (%) Stu (N=40) *Reading*
1. Goal setting	**R**	**20**	0	3	**20**	0	***0***
	U/I	**40**	6	***15***	**40**	0	***18***
2. Directing attention selectively	**R**	**20**	0	0	**0**	5	***0***
	U/I	**20**	18	***6***	**20**	17	***8***
3. Linking with prior knowledge	**R**	**40**	9	0	**0**	0	***0***
	U/I	**60**	6	***0***	**40**	8	***0***
4. Pre-reviewing concepts	**R**	**40**	3	0	**0**	25	***0***
	U/I	**80**	29	***0***	**40**	40	***0***
5. Accessing various resources	**R**	**40**	0	0	**60**	0	***0***
	U/I	**80**	3	***3***	**100**	3	***0***
6. Preparing to confront obstacles	**R**	**20**	6	0	**40**	0	***0***
	U/I	**20**	6	***0***	**40**	5	***0***
7. Predicting outcomes/answers	**R**	**0**	0	0	**0**	0	***0***
	U/I	**20**	3	***0***	**0**	3	***0***
8. Making a plan	**R**	**0**	0	0	**40**	0	***3***
	U/I	**40**	0	***0***	**60**	0	***3***
9. Choosing strategies for the task	**R**	**0**	0	0	**0**	5	***0***
	U/I	**0**	0	***3***	**20**	15	***13***
10. Preparing for class	**R**	**20**	12	0	**0**	27	***0***
	U/I	**60**	12	***0***	**40**	27	***0***
11. Making a timeframe	**R**	**20**	0	0	**20**	0	***0***
	U/I	**20**	0	***0***	**40**	0	***0***
12. Extra reading	**R**	**20**	0	0	**0**	0	***0***
	U/I	**40**	3	***0***	**20**	0	***0***
13. Spending extra time to study/ practice	**R**	**40**	6	0	**20**	0	***0***
	U/I	**20**	6	***0***	**60**	0	***0***
14. Pre-reading	**R**	**0**	12	0	**0**	8	***0***
	U/I	**0**	29	***0***	**0**	23	***3***
15. Suppressing distractions/ inappropriate thoughts	**R**	**0**	0	0	**0**	3	***0***
	U/I	**0**	0	***0***	**0**	3	***0***
16. Arriving class on time	**R**	**0**	9	0	**0**	5	***0***
	U/I	**0**	15	***0***	**0**	10	***0***
17. Selecting a seat	**R**	**0**	3	0	**0**	8	***0***
	U/I	**0**	6	***0***	**0**	10	***0***
18. Effort directed	**R**	**0**	3	0	**0**	0	***0***
	U/I	**0**	0	***0***	**20**	5	***3***
19. Thinking in advance about/discussing the topic	**R**	**0**	0	0	**0**	0	***0***
	U/I	**0**	3	***0***	**0**	10	***0***
20. Predicting the encountered problem	**R**	**0**	0	0	**0**	0	***0***
	U/I	**0**	3	***0***	**0**	3	***0***
21. Intending to concentrate in class	**R**	**0**	0	0	**0**	3	***0***
	U/I	**0**	0	***12***	**0**	5	***8***

Relevance to Students vs Use by Students

From Table 8.8, there is some evidence that students in **both disciplines** employed the strategies that they perceived as relevant. However, they did report using more *Planning strategies* than they perceived as relevant and therefore did a lot of positive learning activities of which they did not appear to realize the value.

Agricultural Science students most often reported using strategy nos. 2, 4, 10, 14 and 16, but only some students saw the relevance of these strategies. This helps explain why the correlation found in the questionnaire for the *Planning* process is rather weak compared with other processes (see Table 5.21). Substantially more **Communication Arts** reported using strategy nos. 2, 4, 9, 14 and 16 than those who noted their relevance. Fewer students indicated the use of nos. 3, 5, 6, 7, 18, 19 and 20 but also without mentioning their relevance. Only strategy nos. 10 *'preparing for class'* and 15 *'suppressing distractions/inappropriate thoughts'* were both perceived as relevant and used by similar numbers of Communication Arts students. This finding for the Communication Arts students contradicts the strong correlations found for the *Planning* process in the questionnaire data (see Table 5.21). Either the limitations of self reports without guided questions or the possibility that some students had developed the ability to use the strategies automatically might explain this inconsistency.

Relevance to Instructors vs Use by Students

As seen on Table 8.8, few strategies deemed relevant by the **Agricultural Science** lecturers were reported to be used by their students, e.g., nos. 2 *'directing attention selectively'*, 4 *'pre-reviewing concepts'* and 10 *'preparing for class'*. Other strategies were used by students regardless of the instructors' perceptions of relevance, e.g., nos. 14 *'pre-reading'* and 15 *'suppressing distractions/inappropriate thoughts'*.

The strategies used most frequently by **Communication Arts** students were not those perceived to be relevant by their lecturers (e.g., nos. 2, 4, 9, 10, 14, 16, 17 and 19).

Thus in **both disciplines,** students' use of *Planning strategies* only weakly related to their lecturers' perceived relevance. However, the evidence for a relationship in the Agricultural Sciences seems to be greater. The use of *Planning strategies* regardless of their instructors' instruction was also found in the questionnaire data (see section 5.8.2).

Only minimal mention was made by students about the use of strategies which they perceived as relevant when **reading** in no case was the report of these strategies strongly related to perceived relevance by either lecturers or students. This supports the findings in the questionnaires that some students have developed the ability to use the strategies independently of their instructors (see section 5.8.2).

8.5.2 *Monitoring Strategies: Perceptions, Incorporation in teaching by instructors and Use by students in listening & reading*

The relevance of *Monitoring strategies* was not well reported in the self reports, therefore only a brief synopsis of the findings is provided here.

The most robust results provided for the use of *Monitoring strategies* when listening to lectures reflected a similarity between students (as seen on Table 8.9). However this was not generally reflected in their lecturers' perceptions of relevance or incorporation in teaching. Only strategies 1 *'comprehension check'* and 2 *'checking progress'* were also deemed relevant by lecturers in **Agricultural Sciences**. On the other hand, Agricultural Science lecturers reported incorporating nos. 1 *'comprehension check'*, 2 *checking progress'*, 3 *'detecting weaknesses/ obstacles* and 6 *'checking the attention'* in their teaching and these strategies were used by Agricultural Science students. Interestingly strategies 10 *'note-taking',* 11 *'self-examination'* were used by students but were not reported at all by lecturers.

Table 8.9 STUDENTS & INSTRUCTORS– Perceived relevance (R) vs Incorporation (I)/Use (U) of monitoring strategies in MSC.

Monitoring Strategies		Ag.Sci (%) Ins (N=5)	Ag.Sci Stu (N=34) Listening	Ag.Sci Stu (N=34) *Reading*	CA (%) Ins (N=5)	CA Stu (N=40) Listening	CA Stu (N=40) *Reading*
1. Comprehension check	**R**	**20**	0	***0***	**0**	0	***3***
	U/I	**80**	41	***15***	**40**	45	***23***
2. Checking progress	**R**	**20**	0	***0***	**0**	0	***0***
	U/I	**60**	18	***0***	**80**	13	***0***
3. Detecting weaknesses/obstacles	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**40**	85	***15***	**80**	73	***25***
4. Seeking related prior knowledge	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	3	***0***	**0**	3	***0***
5. Checking the retrieval of required information	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	3	***0***	**0**	3	***3***
6. Checking the attention	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**60**	56	***6***	**40**	38	***8***
7. Checking appropriateness of the strategy being used	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	3	***0***	**40**	0	***0***
8. Checking importance of the information	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	0	***0***	**0**	3	***0***
9. Checking correctness of the predictions/answers	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	6	***0***	**0**	3	***0***
10. Note taking, i.e., new words, important/ interesting parts	**R**	**0**	9	***3***	**0**	28	***8***
	U/I	**0**	44	***3***	**0**	73	***20***
11. Self-examination	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	29	***0***	**20**	23	***3***
12. Distinguishing inappropriateness from appropriateness	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	3	***0***	**0**	5	***0***

Communication Arts students showed similar use of the same strategies, but their lecturers did not report the relevance of and incorporation of these strategies. Only strategy no. 11 *'self-examination'* was also incorporated into teaching, and only no. 10 *'note-taking'* was also deemed relevant by students. The instructor who noted on strategy 11 described that the main focus of the unit was accuracy of pronunciation and language used in media and it required students to measure themselves. The nature of teaching and learning that was "lecture focused" as reported by many students and the lectures might reinforce the relevance of taking notes.

There was minimal evidence in the self reports of any relationship between the perception, incorporation and use of these *Monitoring strategies* with regard to **reading** MSC materials. **Agricultural Science** students mainly mentioned nos. 1 *'comprehension check'* and 3 *'detecting weaknesses/obstacles'* but no students mentioned the relevance of these strategies for reading. **Communication Arts** students mainly reported nos. 1, 3 and 10 and only the latter was deemed relevant by lecturers (for examining in general). A very small number of Communication Arts students (8 per cent) deemed no. 10 to be relevant for reading.

8.5.3 Problem-solving Strategies: Perceptions, Incorporation in teaching by instructors and Use by students in listening & reading

Relevance to Instructors vs Incorporation in Teaching

Only 4 of the 14 strategies (nos. 4, 16, 24 and 29 in Table 8.10 below) incorporated into lectures by instructors in **Agricultural Sciences** were reported as relevant. Interestingly, strategies 5 *'seeking peer support'* and 14 *'suppressing distraction/inappropriate thoughts'* were noted as relevant even though no instructor included them in lectures. Strategy no. 4 *'linking with prior knowledge'* seen as relevant by 60 per cent (n = 3) but only mentioned as incorporated by one instructor. The inconclusive evidence of a relationship between perceived relevance and incorporation in teaching reflects the insignificant correlation for the whole process found from the questionnaires (see Table 5.26).

Of the seventeen strategies incorporated into the teaching of **Communication Arts,** eleven strategies (nos. 4, 6, 16, 18, 21, 23, 24, 25, 27, 29 and 30) were seen as relevant. Therefore, there may be some relationship between what was perceived as relevant and what was incorporated into teaching. As in the case of the Agricultural Sciences, strategies 5, 11 *'concentration in class'* and 14 were seen as relevant but were not incorporated into teaching. The fact that most of the strategies emerging from the self reports differed from those used in the questionnaires tends to support the weak associations that were found from the questionnaires (see section 5.7.4).

Table 8.10 STUDENTS & INSTRUCTORS– Perceived relevance I vs Incorporation (I)/Use (U) of problem-solving strategies in MSC.

Problem-solving Strategies		Ag.Sci (%) Ins (N=5)	Ag.Sci (%) Stu (N=34) Listening	Ag.Sci (%) Stu (N=34) *Reading*	CA (%) Ins (N=5)	CA (%) Stu (N=40) Listening	CA (%) Stu (N=40) *Reading*
1. Accessing various resources	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**40**	0	***6***	**60**	0	***18***
2. Ignoring problems	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	9	***0***	**0**	0	***0***
3. Asking for clarification	**R**	**0**	6	***3***	**0**	3	***0***
	U/I	**0**	15	***3***	**40**	28	***3***
4. Linking with prior knowledge	**R**	**60**	3	***0***	**20**	3	***0***
	U/I	**20**	6	***0***	**20**	8	***0***
5. Seeking peer support	**R**	**20**	0	***0***	**20**	5	***3***
	U/I	**0**	18	***0***	**0**	40	***13***
6. Trying alternatives	**R**	**0**	0	***0***	**40**	0	***0***
	U/I	**0**	0	***3***	**40**	0	***0***
7. Making guesses	**R**	**0**	3	***0***	**0**	0	***0***
	U/I	**20**	0	***0***	**0**	0	***0***
8. Logic reasoning	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	0	***0***	**20**	0	***0***
9. Self-encouragement	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	9	***3***	**0**	3	***5***
10. Effort directed	**R**	**0**	0	***3***	**0**	5	***3***
	U/I	**20**	9	***3***	**0**	13	***3***
11. Concentration in class	**R**	**0**	35	***3***	**40**	15	***3***
	U/I	**0**	44	***3***	**0**	63	***13***
12. Trying to figure out main ideas	**R**	**0**	0	***0***	**0**	3	***5***
	U/I	**20**	12	***3***	**20**	43	***20***
13. Doing nothing	**R**	**0**	3	***0***	**0**	0	***0***
	U/I	**0**	26	***0***	**0**	8	***0***
14. Suppressing distractions/inappropriate thoughts	**R**	**80**	50	***0***	**60**	10	***0***
	U/I	**0**	26	***3***	**0**	18	***3***
15. Asking for help	**R**	**0**	3	***0***	**0**	3	***0***
	U/I	**20**	9	***0***	**20**	3	***0***
16. Looking for solutions	**R**	**20**	3	***0***	**20**	3	***0***
	U/I	**20**	3	***0***	**40**	3	***0***
17. Reviewing the lessons/notes	**R**	**0**	6	***0***	**0**	13	***5***
	U/I	**20**	18	***9***	**0**	45	***13***
18. Extra reading	**R**	**0**	13	***0***	**20**	32	***8***
	U/I	**60**	21	***3***	**20**	33	***8***
19. Trying to resume concentration	**R**	**0**	3	***0***	**0**	0	***0***
	U/I	**0**	18	***3***	**0**	8	***0***
20. Memorising words/information	**R**	**0**	3	***9***	**0**	0	***0***
	U/I	**0**	3	***9***	**0**	3	***8***
21. Spending extra time to study/practice	**R**	**0**	3	***3***	**40**	3	***3***
	U/I	**40**	3	***3***	**20**	3	***0***
22. Directing attention selectively, i.e., to examples/words	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	3	***0***	**0**	0	***5***

Continues over

Table 8.10 - Continued

Problem-solving Strategies		Ag.Sci (%) Ins (N=5)	Ag.Sci (%) Stu (N=34) Listening	Ag.Sci (%) Stu (N=34) *Reading*	CA (%) Ins (N=5)	CA (%) Stu (N=40) Listening	CA (%) Stu (N=40) *Reading*
23. Solving it alone	**R**	**0**	0	***0***	**20**	0	***0***
	U/I	**0**	47	***0***	**40**	10	***8***
24. Responding in class	**R**	**40**	12	***0***	**40**	10	***0***
	U/I	**80**	41	***0***	**40**	28	***0***
25. Making understanding clear	**R**	**0**	0	***0***	**40**	3	***3***
	U/I	**0**	3	***3***	**40**	28	***13***
26. Re-reading/listening repeatedly	**R**	**0**	0	***6***	**0**	0	***3***
	U/I	**0**	6	***9***	**0**	0	***10***
27. Discussing the problems/ lectures	**R**	**0**	3	***0***	**20**	5	***0***
	U/I	**20**	3	***0***	**60**	25	***0***
28. Giving up	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	15	***0***	**0**	0	***0***
29. Consulting the instructor	**R**	**20**	0	***0***	**40**	3	***3***
	U/I	**20**	3	***0***	**60**	15	***5***
30. Working it out in a group	**R**	**0**	0	***0***	**20**	0	***0***
	U/I	**0**	0	***0***	**40**	0	***0***
31. Adjusting techniques/methods	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	0	***0***	**20**	0	***0***

Relevance to Student vs Use by Students

As evident in Table 8.10, **Agricultural Science** students used more *Problem-solving strategies* than they perceived relevant – except strategy 14 *'suppressing distractions/ inappropriate thoughts'* which was perceived as relevant by half the students but only 26 per cent reported using it. Some 44 per cent of students used strategy no. 11 *'concentration in class',* but only 35 per cent perceived this strategy as relevant. This tends to contradict the result from the questionnaire where ratings on the relevance were higher than use. The fact that many strategies reported in the self reports are requirements of most units and students might have developed to use them independently might affect the relationship between their perceptions of relevance and use. Some strategies were less likely to be seen as relevant, although they were quite frequently used (i.e., nos. 3, 13, 17, 18, 19 and 24). Others were used but no one noted their relevance. Of particular interest is no. 23 *'solving it alone'* which was used by 47 per cent of students but not perceived as relevant at all. This suggests that students may not have considered the relevance of a strategy and solving a problem alone as a relevant activity.

Similarly, more **Communication Arts** students reported using *Problem-solving strategies* than they mentioned the relevance. Although there was more evidence of a relationship between perceptions of relevance and strategy use in this field than Agricultural

Sciences this finding supports the associations found for these strategies in the questionnaire data (see section 5.6.4).

Overall, students in **both disciplines** used many more strategies than they perceived as relevant showing either an inability to reflect objectively on strategies or an ability to use strategies automatically. This is inconsistent with findings from the questionnaires where both groups of students' use of *Problem-solving* strategies was closely linked to their perceptions of relevance (see section 5.6.4). As mentioned earlier, the difference between evidence from the self reports and that from the questionnaires might explain this discrepancy.

More robust evidence of the use of *Problem-solving strategies* for **reading** was provided by Communication Arts students (e.g., nos. 1, 5, 11, 12, 17, 20, 25 and 26) however there was very little reference to the relevance of the strategies.

Relevance to Instructors vs Use by Students

There is some evidence (in Table 8.10 above) that the *Problem-solving strategies* used by students were seen as relevant by the instructors in the Communication Arts. Less evidence of a relationship is found in the Agricultural Sciences.

There were relatively few strategies deemed as relevant by lecturers and used by students (e.g., 4, 5, 14 and 24). There was a stronger relationship for strategy no. 24, *'responding in class'* (claimed to be used by 41 per cent of students), which was seen, as relevant by two instructors. The link between use by students and instructors' perceptions of relevance suggested here in the **Communication Arts** was also found in their responses to the questionnaires (see section 5.8.4).

Reading Related Materials: Relevance to Instructors vs Use by Students

Even though the instructors were not requested to separate between listening and reading the acceptance of authority of the teacher rooted in the Thai culture allows tentative interpretation of their influence on students. Only one strategy, no. 14 *'suppressing distractions/inappropriate thoughts',* that was mentioned as relevant in **Agricultural Science** lecturers' self reports was also reported as being used by one student. Seven strategies (nos. 5, 11, 14, 8, 23, 25 and 29 in Table 8.10 above) used by students were seen as relevant by **Communication Arts** lecturers. Limited evidence of instructors' perceptions of relevance of the strategies to reading suggests that lecturers do not see it as their responsibility to help students with their readings. The types of strategies indicated by the students, for example, *re-reading,* and *memorizing words/information* support this. Therefore, lecturers may be unaware of the fact that a number of students may be reading their texts numerous times in order to understand them. The lack of evidence of instructors' knowledge about *Problem-solving* strategies relating to reading also comes up in the interviews (see section 4.7.3).

8.5.4 Evaluating Strategies in listening & reading: Perceived Relevance, Incorporation in Teaching, Use by Students

Relevance to Instructors vs Incorporation in Teaching

Although the *Evaluating* strategies were not widely mentioned in the self reports, there was some evidence of a relationship between strategy relevance and the explicit teaching of strategies by instructors in **Agricultural Sciences** (i.e., nos. 2, 6, 12, 14 and 16 in Table 8.11).

Table 8.11 STUDENTS & INSTRUCTORS– Perceived relevance (R) vs Incorporation (I)/Use (U) of evaluating strategies in MSC.

Evaluating Strategies		Ag.Sci (%) Ins (N=5)	Ag.Sci (%) Stu (N=34) Listening	Ag.Sci (%) Stu (N=34) *Reading*	CA (%) Ins (N=5)	CA (%) Stu (N=40) Listening	CA (%) Stu (N=40) *Reading*
1. Judging that the goal has been met	**R**	**0**	0	***0***	**20**	0	***0***
	U/I	**0**	0	***0***	**20**	8	***3***
2. Assessing strategy use	**R**	**20**	0	***0***	**0**	0	***0***
	U/I	**60**	62	***6***	**60**	43	***15***
3. Within subject applicability	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	3	***0***	**20**	5	***3***
4. Other area applicability	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	5	***0***	**40**	3	***3***
5. Seeking other suitable strategy	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	3	***0***	**20**	0	***0***
6. Summarising ideas/lessons	**R**	**40**	0	***0***	**20**	5	***0***
	U/I	**80**	20	***3***	**40**	22	***10***
7. Judging how much learned	**R**	**0**	0	***0***	**0**	3	***0***
	U/I	**60**	32	***3***	**60**	33	***18***
8. Assessing correctness of the predictions/answers	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	6	***0***	**0**	0	***3***
9. Comparing new knowledge with known knowledge	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**20**	3	***0***	**0**	3	***0***
10. Judging worthiness of learning	**R**	**0**	0	***0***	**0**	3	***0***
	U/I	**0**	9	***0***	**0**	25	***5***
11. Self-assessment	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	76	***6***	**20**	55	***15***
12. Assessing learning/work	**R**	**20**	0	***0***	**20**	0	***0***
	U/I	**80**	68	***0***	**80**	73	***3***
13. Detecting failure/ weaknesses/ problems	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	71	***6***	**20**	68	***18***
14. Assessing knowledge/information	**R**	**20**	3	***0***	**0**	5	***0***
	U/I	**60**	18	***0***	**40**	25	***10***
15. Refining ideas/skills	**R**	**0**	0	***0***	**0**	0	***0***
	U/I	**0**	5	***0***	**0**	8	***3***
16. Applying learning to practice	**R**	**20**	3	***0***	**0**	0	***0***
	U/I	**80**	3	***0***	**80**	5	***0***

A suggested relationship was only evident for 3 strategies in the **Communication Arts** (e.g., nos. 1 *'judging that the goal has been met'*, 6 *'summarising ideas/lessons'* and 12 *'assessing learning/work'*). This tends to support the significant correlation found in the questionnaires for the whole process in Agricultural Sciences and the non significant result found for the Communication Arts (see section 5.7.5). The finding for strategies 12 *'assessing learning/work'* and 14 *'assessing knowledge/work'* reflects the incorporation of the strategies that the instructors perceived as relevant that was found in the Interviews (see section 4.7.4).

Relevance to Students vs Use by Students

Although there was some strong evidence of strategy use by students in Agricultural Sciences (e.g., nos. 2, 11, 12 and 13) and Communication Arts (e.g., nos. 12 and 13) there was no mention of relevance. This contradicts the findings from the questionnaires (see section 5.6.5) where significant positive associations were found for every *Evaluating strategy*. This might be indicative of the highly developed strategy that involves the unconscious use of strategies.

Relevance to Instructors vs Use by Students

Some *Evaluating strategies* used by **Agricultural Science** students were also those perceived as relevant by their lecturers, e.g., nos. 2, 6, 12. Interestingly, however, there was a high level of use of strategy nos. 11 *'self-assessment'* and 13 *'detecting failure/weaknesses/ problems', which* were not mentioned by Agricultural Science lecturers.

Communication Arts students' use of no. 13 *'detecting failure/weaknesses/problems'* (68 per cent) and, to a lesser extent, no. 2 *'assessing strategy use'* was also ignored by lecturers in their self reports. Moreover, the highly used strategy no. 12 *'assessing learning/work'* (73 per cent) was only reported as relevant by one Communication Arts lecturer.

8.6 ENGLISH: PERCEIVED RELEVANCE, USE BY STUDENTS

Only student informants were requested in the self reports to reflect on how they approached the two tasks of English learning – English listening and reading comprehension. Results from the students in both disciplines are presented in terms of strategies of metacognitive processes. The section presents only two sub-sections, i.e., *Perceived relevance; Use by students,* when learning English and a comparison of these results with those presented earlier in this chapter from the self reports of learning the MSC.

8.6.1 Planning Strategies in English listening & reading: Perceived Relevance & Use by Students

Results are not strong for *Planning strategies* so the actual findings on perceived relevance and use will be combined with the comparisons for MSC and English in section 8.7.

As seen in Table 8.12 below, the students in the **Agricultural Sciences** perceived the relevance of only five of the ten *Planning strategies* that they identified in the MSC self reports. However, in each case the numbers are quite low (< 12 per cent). A somewhat higher percentage of students (18 per cent) used, but did not see as relevant, strategy no. 4 *'pre-reviewing concepts'* which suggests that, to some extent, students were using strategies that they either did not see the relevance of or had never actually reflected objectively about. The second reported highest use strategy was recorded for no. 15 *'consulting a dictionary'* (15 per cent), which is not surprising for an English language class (although one would expect even higher results with poorer students). This may be indicative of the general low motivation for learning English.

The **Communication Arts** students noted the relevance of a greater number of strategies in their self reports, but again the numbers were low (< 10 per cent) and there was little mention of their use. An exception to this was strategy no. 8 *'preparing for class'* which some 30 per cent of this group reported using when listening to English. This may reflect greater motivation among Communication Arts students to learn English since their future careers may rely on global communication. However, another typical language learning strategy no. 17 *'keeping a vocabulary list'* was reported as used by 17 per cent of Agricultural Science students and very few Communication Arts students (3 per cent) suggesting that their Agricultural Science peers did not completely ignore English learning.

Interestingly, more students in **both** groups mentioned the relevance of strategy 3 *'linking with prior knowledge'* than those who said they used it when listening to or reading English. This supports the findings from the questionnaires (see Table 6.2 and Table 6.7). The tendency for the Communication Arts students to be more strategic in learning English was also found in the questionnaire data (see section 6.2.2).

Table 8.12 ENGLISH- Perceived relevance (R) & Use (U) of planning strategies.

Planning Strategies		Perceived Relevance & Use (%) Ag.Sci (N=34) Listening	Ag.Sci (N=34) *Reading*	CA (N=40) Listening	CA (N=40) *Reading*
1. Goal setting	**R**	**0**	*0*	**0**	*0*
	U	**3**	*6*	**10**	*8*
2. Directing attention selectively	**R**	**0**	*0*	**3**	*0*
	U	**3**	*3*	**0**	*0*
3. Linking with prior knowledge	**R**	**12**	*9*	**10**	*13*
	U	**6**	*3*	**8**	*5*
4. Pre-reviewing concepts, i.e., the notes, vocabulary list, lessons	**R**	**0**	*0*	**0**	*0*
	U	**18**	*6*	**3**	*3*
5. Preparing to confront obstacles	**R**	**0**	*0*	**0**	*0*
	U	**0**	*0*	**3**	*0*
6. Predicting outcomes/answers	**R**	**0**	*0*	**0**	*0*
	U	**0**	*3*	**0**	*0*
7. Choosing strategies for the task	**R**	**0**	*0*	**0**	*0*
	U	**0**	*0*	**3**	*3*
8. Preparing for class	**R**	**6**	*0*	**8**	*3*
	U	**12**	*6*	**30**	*5*
9. Making a timeframe	**R**	**0**	*0*	**0**	*0*
	U	**0**	*0*	**3**	*3*
10. Spending extra time to study/practice	**R**	**0**	*0*	**3**	*0*
	U	**3**	*3*	**5**	*3*
11. Pre-reading	**R**	**3**	*6*	**10**	*5*
	U	**3**	*6*	**10**	*8*
12. Arriving class on time	**R**	**0**	*0*	**0**	*0*
	U	**0**	*0*	**3**	*3*
13. Selecting a seat	**R**	**0**	*0*	**5**	*0*
	U	**0**	*0*	**3**	*0*
14. Thinking in advance about/ discussing the topic	**R**	**0**	*0*	**0**	*0*
	U	**3**	*0*	**3**	*3*
15. Consulting a dictionary	**R**	**6**	*3*	**8**	*10*
	U	**15**	*18*	**13**	*22*
16. Memorising words/information	**R**	**0**	*0*	**0**	*0*
	U	**0**	*0*	**3**	*3*
17. Keeping a vocabulary list	**R**	**9**	*3*	**3**	*3*
	U	**12**	*0*	**3**	*3*

Students in either discipline did not frequently perceive *planning strategies as relevant* for **reading comprehension** (see Table 8.12). Interestingly, however, 22 per cent of Communication Arts students and 18 per cent of Agricultural Science students recorded that they used a dictionary. This is surprisingly low given the nature of learning to read in a second language. As in the case of listening, a slightly greater number of students in both fields saw the relevance of strategy 3 *'linking with prior knowledge'* than those who reported using it. It is the only strategy that supports the associations between perceptions of relevance and students' use of *Planning* strategies (although somewhat weakly) that was found in the questionnaire data (see Table 6.12).

The limited number of strategies recorded here are consistent with those in the questionnaires (see Table 6.2 and Table 6.7). It could be assumed from these data that students did not see the task of reading in the L2 as actually requiring cognitive processes.

8.6.2 Monitoring Strategies in English listening & reading: Perceived Relevance and Use by Students

Monitoring strategies such as nos. 1 *'comprehension check'* and 3 *'detecting a problem'* appeared frequently in students' self reports (see Table 8.13). They were recorded for use by 30 per cent or more students for listening to English and when reading English in the **two disciplines**. The remainder of the strategies were mentioned only minimally and in no case was usage equivalent to perceived relevance that was reported infrequently.

Table 8.13 ENGLISH- Perceived relevance (R) & Use (U) of monitoring strategies

Monitoring Strategies		Perceived Relevance & Use (%)			
		Ag.Sci (N=34)		CA (N=40)	
		Listening	*Reading*	Listening	*Reading*
1. Comprehension check	R	0	0	5	0
	U	53	30	48	40
2. Checking progress	R	0	0	0	0
	U	26	9	3	0
3. Detecting weaknesses/obstacle	R	0	0	3	0
	U	65	32	48	35
4. Checking the attention	R	0	0	0	0
	U	9	6	8	0
5. Note taking, i.e., new words, important/ interesting parts, grammatical rules	R	3	3	8	5
	U	6	3	13	8
6. Self-examination	R	0	0	3	0
	U	12	3	3	5

8.6.3 Problem-solving Strategies: Perceived relevance and Use in listening to & reading English

Problem solving was mentioned more frequently in the self report data than any other metacognitive processes, although it was not always perceived as relevant by **either group** of students. Strategy no. 5 *'linking with prior knowledge'* (see Table 8.14 below) was evident in the self reports and was both perceived as relevant and used by small percentages of students in both listening and reading (< 21 per cent).

Agricultural Science students perceived the relevance of *looking for solutions* (no. 16), and *keeping a vocabulary list* (no. 22) when listening and reading, but there was little or no evidence of them actually using these strategies (< 18 per cent). Surprisingly, only 18 per cent of Agricultural Science students said they *consulted a dictionary* (no. 20) to solve a listening or reading problem (see Table 8.14 below). However, only one of these students recorded the relevance of this strategy. Of more concern was the fact that some 23 per cent of these students *did nothing* (strategy no. 13) when they had a problem with listening. Again these results possibly reflect the level of motivation for learning English among Agricultural Science students which has already been reported in Chapter 6 (sections 6.1.4 and 6.2.4).

Table 8.14 ENGLISH- Perceived relevance (R) & Use (U) of problem-solving strategies.

Problem-solving Strategies		**Perceived Relevance & Use (%)**			
		Ag.Sci (N=34)		**CA (N=40)**	
		Listening	*Reading*	**Listening**	*Reading*
1. Rehearsing	**R**	**0**	*0*	**3**	*3*
	U	**9**	*3*	**15**	*8*
2. Accessing various resources	**R**	**0**	*0*	**0**	*3*
	U	**0**	*0*	**8**	*13*
3. Ignoring problems	**R**	**0**	*0*	**0**	*0*
	U	**15**	*9*	**3**	*0*
4. Asking for clarification	**R**	**0**	*0*	**0**	*0*
	U	**3**	*0*	**3**	*3*
5. Linking with prior knowledge	**R**	**15**	*12*	**5**	*13*
	U	**21**	*12*	**8**	*18*
6. Seeking peer support	**R**	**0**	*0*	**8**	*0*
	U	**9**	*6*	**20**	*8*
7. Trying alternatives	**R**	**0**	*0*	**0**	*0*
	U	**0**	*0*	**0**	*3*
8. Making guesses	**R**	**0**	*0*	**0**	*0*
	U	**0**	*0*	**5**	*0*
9. Self-encouragement	**R**	**0**	*0*	**0**	*0*
	U	**0**	*0*	**3**	*3*
10. Effort directed	**R**	**9**	*3*	**10**	*8*
	U	**12**	*6*	**15**	*13*
11. Concentration in class	**R**	**6**	*3*	**8**	*8*
	U	**15**	*6*	**48**	*28*
12. Trying to figure out main ideas	**R**	**0**	*3*	**0**	*3*
	U	**3**	*3*	**8**	*5*
13. Doing nothing	**R**	**0**	*0*	**0**	*0*
	U	**23**	*9*	**10**	*5*
14. Suppressing distractions/inappropriate thoughts	**R**	**0**	*0*	**5**	*0*
	U	**3**	*0*	**8**	*3*
15. Asking for help	**R**	**0**	*0*	**3**	*3*
	U	**3**	*3*	**18**	*13*

Continues over

Table 8.14 – Continued

Problem-solving Strategies		Perceived Relevance & Use (%)			
		Ag.Sci (N=34)		CA (N=40)	
		Listening	*Reading*	**Listening**	*Reading*
16. Looking for solutions	**R**	**18**	*0*	**10**	*0*
	U	**0**	*0*	**0**	*0*
17. Reviewing the lessons/notes	**R**	**6**	*6*	**10**	*13*
	U	**9**	*3*	**10**	*13*
18. Extra reading	**R**	**0**	*0*	**8**	*5*
	U	**0**	*0*	**3**	*5*
19. Trying to resume concentration	**R**	**0**	*0*	**0**	*0*
	U	**3**	*0*	**0**	*0*
20. Consulting the dictionary	**R**	**3**	*3*	**3**	*10*
	U	**18**	*6*	**15**	*30*
21. Memorising words/information	**R**	**0**	*0*	**0**	*0*
	U	**0**	*0*	**3**	*3*
22. Keeping a vocabulary list	**R**	**18**	*18*	**8**	*3*
	U	**0**	*3*	**8**	*3*
23. Spending extra time to study/ practice	**R**	**15**	*9*	**13**	*10*
	U	**3**	*6*	**5**	*8*
24. Directing attention selectively, i.e., to examples/words	**R**	**0**	*0*	**8**	*5*
	U	**9**	*3*	**15**	*3*
25. Using context clues	**R**	**0**	*0*	**0**	*0*
	U	**0**	*0*	**3**	*3*
26. Converting into L1	**R**	**0**	*12*	**3**	*3*
	U	**9**	*12*	**15**	*10*
27. Using hints/body language	**R**	**0**	*0*	**0**	*0*
	U	**0**	*0*	**3**	*0*
28. Responding in class	**R**	**0**	*0*	**0**	*0*
	U	**3**	*0*	**0**	*0*
29. Making understanding clear	**R**	**0**	*0*	**5**	*5*
	U	**3**	*3*	**5**	*3*
30. Re-reading/listening repeatedly	**R**	**0**	*0*	**0**	*0*
	U	**0**	*0*	**3**	*3*
31. Giving up	**R**	**0**	*0*	**0**	*0*
	U	**3**	*3*	**10**	*0*
32. Consulting the instructor	**R**	**3**	*5*	**3**	*3*
	U	**0**	*9*	**18**	*13*
33. Making revision	**R**	**6**	*6*	**0**	*0*
	U	**0**	*0*	**0**	*0*

Communication Arts students provided more frequent mention of this set of metacognitive strategies, although the results were still not robust. The most widely used strategy among these students was no. 11 *'concentration in class'* (48 per cent for listening and 28 per cent for reading), which far fewer students (8 per cent) saw as relevant. Strategy nos. 1, 6, 10, 15 20, 24, 26 and 32 (in Table 8.14) were mentioned by 15-20 per cent of students. These strategies were also seen as relevant, but by fewer students (3-13 per cent). Another 18 strategies were used by small proportions of students and some were also perceived as relevant.

Interestingly, some strategies were noted as relevant but relatively few or none reported using them (e.g., nos. 16 *'looking for solutions'*, 22 *'keeping a vocabulary list'*, 23 *'spending extra time to study/practice'*, and 33 *'making revision'* in Agricultural Sciences and nos. 16 and 23 in Communication Arts). A report from one student might explain what prevented students from using these strategies. She recorded,

> …To say the truth, I thirsted to understand it. Yet, it was impossible. I had no background. I knew only a few words and less grammatical rules I could use. Thinking of it made me feel so sorry that I gave up.

A reference to a greater number of *Problem solving strategies* was observed in the self reports of **Communication Arts** students: about 30 per cent noted *'consulting a dictionary'*, while 18 per cent noted *linking with prior knowledge* (strategy no. 5). The use of 5 strategies (2, 5, 6, 7 and 8) when reading English is also consistent with those in the questionnaires (see Table 6.9), but is mentioned by relatively few students. There was more evidence that students in this group deemed to use the strategies they thought as relevance. This, to some extent, supports a near perfect correlation for the whole *Problem-solving* process in Communication Arts (see Table 6.11).

8.6.4 Evaluating Strategies in English listening& reading: Perceived Relevance and Use by Students

With regard to listening to the L2, *Evaluating* strategy no. 8 *'detecting failure/weaknesses/problems'* (in Table 8.15 below) was the most widely used strategy among students in **both disciplines** (82 and 83 per cent). These students were therefore well aware of their failure, poor ability and insufficient background when listening in English. This strategy was also frequently mentioned in relation to reading.

More than half the **Agricultural Science** students noted using strategies 3 *'judging how much learned'* and 6 *'self-assessment'* for listening and reading. Strategies 1 *'assessing strategy use'* and 7 *'assessing learning/work'* were also often mentioned for listening and reading. A greater number of **Communication Arts** students mentioned strategies 1 and 6 while fewer students recorded using strategies 3 and 7. This supports the greater motivation of Communication Arts students to learn English that was found in the questionnaires (see section 6.2.5). Interestingly, no one noted the relevance of these strategies in their reports.

Table 8.15 ENGLISH- Perceived relevance (R) & Use (U) of evaluating strategies.

Evaluating Strategies		Perceived Relevance & Use (%)			
		Ag.Sci (N=34)		CA (N=40)	
		Listening	*Reading*	Listening	*Reading*
1. Assessing strategy use	R	0	*0*	0	*0*
	U	35	*24*	55	*35*
2. Within subject applicability	R	0	*0*	3	*0*
	U	0	*0*	3	*0*
3. Judging how much learned	R	0	*0*	0	*0*
	U	53	*50*	38	*35*
4. Comparing new knowledge with known knowledge	R	0	*0*	0	*0*
	U	0	*0*	0	*5*
5. Judging worthiness of learning	R	0	*0*	0	*0*
	U	18	*18*	25	*18*
6. Self-assessment	R	0	*0*	0	*0*
	U	56	*53*	68	*60*
7. Assessing learning/work	R	0	*0*	0	*0*
	U	47	*26*	33	*20*
8. Detecting failure/ weaknesses/ problems	R	0	*0*	0	*0*
	U	82	*65*	83	*63*
9. Assessing knowledge/information	R	0	*0*	0	*0*
	U	3	*3*	15	*13*
10. Refining ideas/skills	R	0	*0*	0	*0*
	U	3	*3*	0	*0*

8.7 MSC vs ENGLISH: PERCEIVED RELEVANCE

8.7.1 Planning Strategies: Relevance to listening & reading

Listening: Perceived Relevance to MSC vs English

There is little evidence in Table 8.16 (below) of any association between the perceived relevance of *Planning strategies* in **Agricultural Sciences** for the MSC and English in the data from self reports. Strategies 8 *'preparing for class'* and 10 *'pre-reading'* were recorded as marginally relevant in MSC listening (12 per cent), even less when listening to English. However, there was more frequent mention of strategy 3 *'linking with prior knowledge'* in the MSC (9 per cent) and in English (12 per cent). Other reference to the relevance of planning in English and the MSC was minimal.

Table 8.16 MSC vs ENGLISH- Relevance of planning processes in listening & reading.

Planning Strategies		Perceived Relevance (%)			
		Listening [1]		Reading[2]	
		MSC	English	MSC	English
1. Goal setting	Ag.Sci	0	0	3	0
	Comm.Arts	0	0	0	0
2. Directing attention selectively	Ag.Sci	0	0	0	0
	Comm.Arts	5	3	0	0
3. Linking with prior knowledge	Ag.Sci	9	12	0	9
	Comm.Arts	0	10	0	13
4. Pre-reviewing concepts	Ag.Sci	3	0	0	0
	Comm.Arts	25	0	0	0
5. Preparing to confront obstacles	Ag.Sci	6	0	0	0
	Comm.Arts	0	0	0	0
6. Making a plan	Ag.Sci	0	9	0	0
	Comm.Arts	0	3	3	0
7. Choosing strategies for the task	Ag.Sci	0	0	0	0
	Comm.Arts	5	0	0	0
8. Preparing for class	Ag.Sci	12	6	0	0
	Comm.Arts	27	8	0	3
9. Spending extra time to study/practice	Ag.Sci	6	0	0	0
	Comm.Arts	0	3	0	0
10. Pre-reading	Ag.Sci	12	3	0	6
	Comm.Arts	8	10	0	5
11. Suppressing distractions/ inappropriate thoughts	Ag.Sci	0	0	0	0
	Comm.Arts	3	0	0	0
12. Arriving class on time	Ag.Sci	9	0	0	0
	Comm.Arts	5	0	0	0
13. Selecting a seat	Ag.Sci	3	0	0	0
	Comm.Arts	8	5	0	0
14. Effort directed	Ag.Sci	3	0	0	0
	Comm.Arts	0	0	0	0
15. Consulting a dictionary	Ag.Sci	0	6	0	3
	Comm.Arts	0	8	0	10
16. Keeping a vocabulary list	Ag.Sci	0	9	0	3
	Comm.Arts	0	3	0	3
17. Intending to concentration in class	Ag.Sci	0	0	0	0
	Comm.Arts	3	0	0	0

1. Listening to the MSC lectures mainly involves comprehending the subject content, while most listening tasks in English for Specific Purposes aim at comprehending unfamiliar language.
2. The same difference is applied to reading. Reading in the L1 aims at comprehending major subject content and English reading mainly focuses on comprehending a foreign language

Communication Arts students also mentioned the perceived relevance of strategies in both the MSC and English. Only *'preparing for class'* (no. 8) was reported as relevant by 27 per cent of students in the MSC, but only 8 per cent of students reported seeing this as relevant for learning English. This suggests either a greater commitment to learning the MSC or more reflection on how to succeed in the MSC. This is possibly also evident in the reporting of strategy 4 *'pre-reviewing concepts'* yet this strategy was not mentioned at all with regard to English by 25% of Communication Arts students. References to strategies 3 *'linking with prior knowledge'*, 10 *'pre-reading'* and 15 *'consulting a dictionary'* in English suggests that some students generate strategies specifically for listening and reading in English and quite separately from the MSC.

8.7.2 Monitoring Strategies: Relevance to listening & reading

Only the *note taking* strategy was reported as important for both L1 and L2 listening and reading by a few students in the given disciplines in their self reports. Even though 28 per cent of **Communication Arts** recorded it as relevant to listening to the MSC lectures only 8 per cent recorded its importance for L2 listening (see Table 8.2 and Table 8.13).

8.7.3 Problem-solving Strategies: Relevance to listening & reading

Perceived Relevance to MSC vs English

As seen in Table 8.17 below, *Problem-solving strategies* were not strongly represented in the self report data relating to listening to the MSC lectures, and few or no students recorded them as relevant for listening and reading in **either discipline**. For instance, there was no reference to the relevance of strategy no. 11 *'suppressing distractions/inappropriate thoughts'* to listening or reading in English, but half the Agricultural Science students saw it as relevant to the MSC. The importance of *'extra reading'* (strategy 15) was deemed relevant by 32 per cent of Communication Arts students for listening to the MSC lectures, but was only mentioned by 8 per cent for listening to English (even fewer for reading English). By contrast, there was more evidence of the importance of some strategies for the L2 than the MSC, but only minimally. A small number of students in both fields mentioned the relevance of *'keeping a vocabulary list'* (no. 19) for the L2 and not for the MSC which is not surprising given the nature of language learning compared with content learning in the L1. Some students noted the importance of *linking with prior knowledge* (no. 4), *looking for solutions* (no. 13), *memorising words/ information* (no. 18) and *spending extra time studying/practising* (no. 20) for English rather than for the MSC. This shows the need for markedly different learning strategies for the L1 and for learning in the L2.

Table 8.17 MSC vs ENGLISH- Relevance of problem-solving strategies in listening & reading.

Problem-solving Strategies		Perceived Relevance (%)			
		Listening [1]		Reading[2]	
		MSC	English	MSC	English
1. Rehearsing	Ag.Sci	**0**	*0*	**0**	*0*
	Comm.Arts	**0**	*3*	**0**	*3*
2. Accessing various resources	Ag.Sci	**0**	*0*	**0**	*0*
	Comm.Arts	**0**	*0*	**0**	*3*
3. Asking for clarification	Ag.Sci	**6**	*0*	**3**	*0*
	Comm.Arts	**3**	*0*	**0**	*0*
4. Linking with prior knowledge	Ag.Sci	**3**	*15*	**0**	*12*
	Comm.Arts	**3**	*5*	**0**	*13*
5. Seeking peer support	Ag.Sci	**0**	*0*	**0**	*0*
	Comm.Arts	**5**	*8*	**3**	*0*
6. Making guesses	Ag.Sci	**0**	*0*	**0**	*0*
	Comm.Arts	**3**	*0*	**0**	*0*
7. Effort directed	Ag.Sci	**0**	*9*	**3**	*3*
	Comm.Arts	**5**	*10*	**3**	*8*
8. Concentration in class	Ag.Sci	**35**	*6*	**3**	*3*
	Comm.Arts	**15**	*8*	**3**	*8*
9. Trying to figure out main ideas	Ag.Sci	**0**	*0*	**0**	*3*
	Comm.Arts	**3**	*0*	**5**	*3*
10. Doing nothing	Ag.Sci	**3**	*0*	**0**	*0*
	Comm.Arts	**0**	*0*	**0**	*0*
11. Suppressing distractions/inappropriate	Ag.Sci	**50**	*0*	**0**	*0*
	Comm.Arts	**10**	*5*	**0**	*0*
12. Asking for help	Ag.Sci	**3**	*0*	**0**	*0*
	Comm.Arts	**3**	*3*	**0**	*3*
13. Looking for solutions	Ag.Sci	**3**	*18*	**0**	*0*
	Comm.Arts	**3**	*10*	**0**	*0*
14. Reviewing the lessons/notes	Ag.Sci	**6**	*6*	**0**	*6*
	Comm.Arts	**13**	*10*	**5**	*13*
15. Extra reading	Ag.Sci	**13**	*0*	**0**	*0*
	Comm.Arts	**32**	*8*	**8**	*5*
16. Trying to resume concentration	Ag.Sci	**3**	*0*	**0**	*0*
	Comm.Arts	**0**	*0*	**0**	*0*
17. Consulting the dictionary	Ag.Sci	**0**	*3*	**0**	*3*
	Comm.Arts	**0**	*3*	**0**	*10*
18. Memorising words/information	Ag.Sci	**3**	*0*	**9**	*0*
	Comm.Arts	**0**	*0*	**0**	*0*
19. Keeping a vocabulary list	Ag.Sci	**0**	*18*	**0**	*18*
	Comm.Arts	**0**	*8*	**0**	*3*

Continues over

Table 8.17 - Continued

Problem-solving Strategies		Perceived Relevance (%)			
		Listening [1]		Reading ng[2]	
		MSC	English	MSC	English
20. Spending extra time to study/practice	**Ag.Sci**	**3**	*15*	**3**	*9*
	Comm.Arts	**3**	*13*	**3**	*10*
21. Directing attention selectively, i.e., to examples/words/	**Ag.Sci**	**0**	*0*	**0**	*0*
	Comm.Arts	**0**	*8*	**0**	*5*
22. Converting into L1	**Ag.Sci**	**0**	*0*	**0**	*12*
	Comm.Arts	**0**	*3*	**0**	*3*
23. Responding in class	**Ag.Sci**	**12**	*0*	**0**	*0*
	Comm.Arts	**10**	*0*	**0**	*0*
24. Making understanding clear	**Ag.Sci**	**0**	*0*	**0**	*0*
	Comm.Arts	**3**	*5*	**3**	*5*
25. Re-reading/listening repeatedly	**Ag.Sci**	**0**	*0*	**6**	*0*
	Comm.Arts	**0**	*0*	**3**	*0*
26. Consulting the instructor	**Ag.Sci**	**0**	*3*	**0**	*5*
	Comm.Arts	**3**	*3*	**3**	*3*
27. Making revision	**Ag.Sci**	**0**	*6*	**0**	*6*
	Comm.Arts	**0**	*0*	**0**	*0*
28. Discussing the problems	**Ag.Sci**	**3**	*0*	**0**	*0*
	Comm.Arts	**5**	*0*	**0**	*0*

1. Listening to the MSC lectures mainly involves comprehending the subject content, while most listening tasks in English for Specific Purposes aim at comprehending an unfamiliar language.
2. The same difference is applied to reading. Reading in the L1 aims at comprehending major subject content and English reading mainly focuses on comprehending a foreign language

8.7.4 Evaluating Strategies: Relevance to listening & reading

Only the *within subject applicability* strategy (no. 2 of *Evaluating strategies*) was perceived as relevant in both the MSC and English listening by one Communication Arts student, therefore no genuine comparison is possible.

8.8 USE BY STUDENTS: MSC vs ENGLISH

8.8.1 Planning Strategies: Use in listening & reading

Use in MSC vs English

As evident in Table 8.18 below, **Agricultural Science** students used eight strategies in both **listening** to the MSC lectures and English. Half of these (i.e., strategies 3, 4, 9 and 18) were reported to the same extent in English and the MSC. Other strategies were reported as being used in English to a lesser extent than in the MSC (nos. 1, 2, 12 and 13). However, strategy 15 *'arriving on time'* was used in the MSC by 15 per cent of students, but not at all in English. Conversely, two strategies were used only in English, i.e., *consulting a dictionary* (strategy no. 2) and *'keeping vocabulary list'* (no. 8). Clearly, these strategies are specific to language learning.

Table 8.18 MSC vs ENGLISH – Use of planning strategies in listening & reading.

Planning Strategies		Use by Students (%)			
		Listening [1]		Reading[2]	
		MSC	English	MSC	English
1. Goal setting	Ag.Sci	6	3	15	6
	Comm.Arts	0	10	18	8
2. Directing attention selectively	Ag.Sci	18	3	6	3
	Comm.Arts	17	0	8	0
3. Linking with prior knowledge	Ag.Sci	6	6	0	3
	Comm.Arts	8	8	0	5
4. Reviewing the notes/vocabulary list	Ag.Sci	18	18	9	6
	Comm.Arts	45	3	13	3
5. Accessing various resources	Ag.Sci	3	0	3	0
	Comm.Arts	3	0	0	0
6. Preparing to confront obstacles	Ag.Sci	6	0	0	0
	Comm.Arts	5	3	0	0
7. Predicting outcomes/answers	Ag.Sci	3	0	0	3
	Comm.Arts	3	0	0	0
8. Choosing strategies for the task	Ag.Sci	0	0	3	0
	Comm.Arts	15	3	13	3
9.Preparing for class	Ag.Sci	12	12	0	6
	Comm.Arts	27	30	0	5
10. Making a timeframe	Ag.Sci	0	0	0	0
	Comm.Arts	0	3	0	3
11. Extra reading	Ag.Sci	3	0	0	0
	Comm.Arts	0	0	0	0
12. Spending extra time to study/practice	Ag.Sci	6	3	0	3
	Comm.Arts	0	5	0	3
13. Pre-reading	Ag.Sci	29	3	0	6
	Comm.Arts	23	10	3	8
14. Suppressing distractions/ inappropriate thoughts	Ag.Sci	0	0	0	0
	Comm.Arts	3	0	0	0
15. Arriving class on time	Ag.Sci	15	0	0	0
	Comm.Arts	10	3	0	3

Continues over

Table 8.18 - Continued-

Planning Strategies		Use by Students (%)			
		Listening [1]		Reading[2]	
		MSC	English	MSC	English
16. Selecting a seat	Ag.Sci	6	0	0	0
	Comm.Arts	10	3	0	0
17. Effort directed	Ag.Sci	0	0	0	0
	Comm.Arts	5	0	3	0
18. Thinking in advance about/discussing the topic	Ag.Sci	3	3	0	0
	Comm.Arts	10	3	0	3
19. Predicting the encountered problem	Ag.Sci	3	0	0	0
	Comm.Arts	3	0	0	0
20. Consulting a dictionary	Ag.Sci	0	15	0	18
	Comm.Arts	0	13	0	22
21. Memorising words	Ag.Sci	0	0	0	0
	Comm.Arts	0	3	0	3
22. Keeping a vocabulary list	Ag.Sci	0	12	0	0
	Comm.Arts	0	3	0	3
23. Intending to concentrate in class	Ag.Sci	0	0	12	0
	Comm.Arts	5	0	8	0

1. Listening to the MSC lectures mainly involves comprehending the subject content, while most listening tasks in English for Specific Purposes aim at comprehending an unfamiliar language.
2. The same difference is applied to reading. Reading in the L1 aims at comprehending major subject content and English reading mainly focuses on comprehending a foreign language

Communication Arts students in their self reports showed little evidence of *Planning strategies* in the MSC or English. However, of particular interest here is the widespread use of strategy no. 9 *'preparing for class'* in English (30 per cent) and in the MSC (27 per cent). This might be indicative of a more positive attitude to learning English compared with Agricultural Science students who simply wanted to pass their English units. The weak relationship between listening and reading in the two disciplines reflects the relatively weak associations between the MSC and English ratings seen in the questionnaire results for the *Planning strategies* (see section 7.2.2).

With regard to **reading**, 22 and 18 per cent of **Communication Arts** and **Agricultural Science** students, respectively, noted using a dictionary when reading the L2. By contrast, both groups of students used *'goal setting'* (no. 1) in their MSC reading but marginally in English reading. *'Reviewing notes/vocabulary list'* (no. 4) and *'choosing strategies for the task'* (no. 8) were *Planning strategies* used by 13 per cent of Communication Arts students for reading in the MSC but less so for the L2. As expected use of strategy no. 20 *'consulting a dictionary'* was reported by both student groups for English and not the MSC reading. With such minimal results there is little evidence of transfer of *Planning strategies* from reading materials in the native language to English reading comprehension.

8.8.2 Monitoring Strategies: Use in listening & reading

Six *Monitoring* strategies (nos. 1, 2, 3, 6, 10 and 11 in Table 8.19) were used in both learning contexts by students in **both disciplines**. However, only strategies 1, 3 and 10 were used by both groups of students when reading in Thai and English.

Table 8.19 MSC vs ENGLISH – Use of monitoring strategies in listening & reading.

Monitoring Strategies		Use by Students (%)			
		Listening [1]		Reading[2]	
		MSC	*English*	MSC	*English*
1. Comprehension check	Ag.Sci	**41**	*53*	**15**	*30*
	Comm.Arts	**45**	*48*	**23**	*40*
2. Checking progress	Ag.Sci	**18**	*26*	**0**	*9*
	Comm.Arts	**13**	*3*	**0**	*0*
3. Detecting weaknesses/obstacle	Ag.Sci	**85**	*65*	**15**	*32*
	Comm.Arts	**73**	*48*	**25**	*35*
4. Seeking related prior knowledge	Ag.Sci	**3**	*0*	**0**	*0*
	Comm.Arts	**3**	*0*	**0**	*0*
5. Checking the retrieval of required information	Ag.Sci	**3**	*0*	**0**	*0*
	Comm.Arts	**3**	*0*	**3**	*0*
6. Checking the attention	Ag.Sci	**56**	*9*	**6**	*6*
	Comm.Arts	**38**	*8*	**8**	*0*
7. Checking appropriateness of the strategy being used	Ag.Sci	**3**	*0*	**0**	*0*
	Comm.Arts	**0**	*0*	**0**	*0*
8. Checking importance of the information	Ag.Sci	**0**	*0*	**0**	*0*
	Comm.Arts	**3**	*0*	**0**	*0*
9. Checking correctness of the predictions	Ag.Sci	**6**	*0*	**0**	*0*
	Comm.Arts	**3**	*0*	**0**	*0*
10. Note taking, i.e., new words, important/ interesting parts	Ag.Sci	**44**	*6*	**3**	*3*
	Comm.Arts	**73**	*13*	**20**	*8*
11. Self-examination	Ag.Sci	**29**	*12*	**0**	*3*
	Comm.Arts	**23**	*3*	**3**	*5*
12. Distinguishing appropriateness from inappropriateness	Ag.Sci	**3**	*0*	**0**	*0*
	Comm.Arts	**5**	*0*	**0**	*0*

1. Listening to the MSC lectures mainly involves comprehending the subject content, while most listening tasks in English for Specific Purposes aim at comprehending an unfamiliar language.
2. The same difference is applied to reading. Reading in the L1 aims at comprehending major subject content and English reading mainly focuses on comprehending a foreign language

The first three strategies reflect the significant positive association between the MSC and English ratings found in the questionnaire data (see Table 7.8). However the lack of use of strategy 6 *'checking the attention'* in English contradicts the strong associations found in the questionnaires for the Agricultural Sciences and the Communication Arts (see Table 7.8). This might reflect a greater commitment to learning the MSC rather than any use of learning strategies when learning English.

8.8.3 Problem-solving Strategies: Use in listening & reading

Use in MSC vs English

As seen in Table 8.20 below, a range of *Problem solving* strategies were included in students' self reports. The strategies that used most in **both discipline** areas by Agricultural Science students were nos. 11 *'concentration in class'* and 13 *'doing nothing'*. Their Communication Arts counterparts mainly used strategies 6, 10, 11, 17 and 32 in listening to both the MSC lectures and English. The relatively high percentages in the MSC and low percentages in the L2 for most of these strategies are suggestive again of an overall lack of motivation among a considerable proportion of the students. Higher frequent use of the *Problem solving* strategies in learning the MSC was also found in the questionnaires (see Table 7.9). Some strategies (e.g., nos. 18 *'extra reading',* 33 *'solving it alone'*) were not reported very much for English, but were prevalent in the MSC suggesting that students were not independent learners of English.

However, some strategies, e.g., 20 *'consulting a dictionary'* and 26 *'converting into L1'* were used in the L2 but not for the MSC. These results are consistent with the application of the *Planning* process (section 8.8.1). As these strategies are specific to language learning, they imply the development of additional learning strategies in the L2.

A further notable result reflected in these data is the strong reliance on avoidance (such as strategies 3 *'ignoring problem'* and 13 *'doing nothing'*) in both the MSC and in English among Agricultural Science students, but not among Communication Arts students who show a greater tendency towards active learning. This was also apparent in the questionnaires (see Table 7.9).

Table 8.20 MSC vs ENGLISH – Use of problem-solving strategies listening & reading.

Problem-solving Strategies		Use by Students (%)			
		Listening [1]		Reading[2]	
		MSC	English	MSC	English
1. Rehearsing	Ag.Sci	**0**	*9*	**0**	*3*
	Comm.Arts	**0**	*15*	**0**	*8*
2. Accessing various resources	Ag.Sci	**0**	*0*	**6**	*0*
	Comm.Arts	**0**	*8*	**18**	*13*
3. Ignoring problems	Ag.Sci	**9**	*15*	**0**	*9*
	Comm.Arts	**0**	*3*	**0**	*0*
4. Asking for clarification	Ag.Sci	**15**	*3*	**3**	*0*
	Comm.Arts	**28**	*3*	**3**	*3*
5. Linking with prior knowledge	Ag.Sci	**6**	*21*	**0**	*12*
	Comm.Arts	**8**	*8*	**0**	*18*
6. Seeking peer support	Ag.Sci	**18**	*9*	**0**	*6*
	Comm.Arts	**40**	*20*	**13**	*8*
7. Trying alternatives	Ag.Sci	**0**	*0*	**3**	*0*
	Comm.Arts	**0**	*0*	**0**	*3*
8. Making guesses	Ag.Sci	**0**	*0*	**0**	*0*
	Comm.Arts	**0**	*5*	**0**	*0*
9. Self-encouragement	Ag.Sci	**9**	*0*	**3**	*0*
	Comm.Arts	**3**	*3*	**5**	*3*
10. Effort directed	Ag.Sci	**9**	*12*	**3**	*6*
	Comm.Arts	**13**	*15*	**3**	*13*
11. Concentration in class	Ag.Sci	**44**	*15*	**3**	*6*
	Comm.Arts	**63**	*48*	**13**	*28*
12. Trying to figure out main ideas	Ag.Sci	**12**	*3*	**3**	*3*
	Comm.Arts	**43**	*8*	**20**	*5*
13. Doing nothing	Ag.Sci	**26**	*23*	**0**	*9*
	Comm.Arts	**8**	*10*	**0**	*5*
14. Suppressing distractions/ inappropriate thoughts	Ag.Sci	**26**	*3*	**3**	*0*
	Comm.Arts	**18**	*8*	**3**	*3*
15. Asking for help	Ag.Sci	**9**	*3*	**0**	*3*
	Comm.Arts	**3**	*18*	**0**	*13*
16. Looking for solutions	Ag.Sci	**3**	*0*	**0**	*0*
	Comm.Arts	**3**	*0*	**0**	*0*
17. Reviewing the lessons/notes	Ag.Sci	**18**	*9*	**9**	*3*
	Comm.Arts	**45**	*10*	**13**	*13*
18. Extra reading	Ag.Sci	**21**	*0*	**3**	*0*
	Comm.Arts	**33**	*3*	**8**	*5*
19. Trying to resume concentration	Ag.Sci	**18**	*3*	**3**	*0*
	Comm.Arts	**8**	*0*	**0**	*0*

Continues over

Table 8.20 - Continued

Problem-solving Strategies		Use by Students (%)			
		Listening [1]		Reading[2]	
		MSC	English	MSC	English
20. Consulting the dictionary	Ag.Sci	**0**	*18*	**0**	*6*
	Comm.Arts	**0**	*15*	**0**	*30*
21. Memorising words/ information	Ag.Sci	**3**	*0*	**9**	*0*
	Comm.Arts	**3**	*3*	**8**	*3*
22. Keeping a vocabulary list	Ag.Sci	**0**	*0*	**0**	*3*
	Comm.Arts	**0**	*8*	**0**	*3*
23. Spending extra time to study/ practice	Ag.Sci	**3**	*3*	**3**	*6*
	Comm.Arts	**3**	*5*	**0**	*8*
24. Directing attention selectively, i.e., to examples/words	Ag.Sci	**3**	*9*	**0**	*3*
	Comm.Arts	**0**	*15*	**5**	*3*
25. Using context clues	Ag.Sci	**0**	*0*	**0**	*0*
	Comm.Arts	**0**	*3*	**0**	*3*
26. Converting into L1	Ag.Sci	**0**	*9*	**0**	*12*
	Comm.Arts	**0**	*15*	**0**	*10*
27. Using hints/body language	Ag.Sci	**0**	*0*	**0**	*0*
	Comm.Arts	**0**	*3*	**0**	*0*
28. Responding in class	Ag.Sci	**41**	*3*	**0**	*0*
	Comm.Arts	**28**	*0*	**0**	*0*
29. Making understanding clear	Ag.Sci	**3**	*3*	**3**	*3*
	Comm.Arts	**28**	*5*	**13**	*3*
30. Re-reading/listening repeatedly	Ag.Sci	**6**	*0*	**9**	*0*
	Comm.Arts	**0**	*3*	**10**	*3*
31. Giving up	Ag.Sci	**15**	*3*	**0**	*3*
	Comm.Arts	**0**	*10*	**0**	*0*
32. Consulting the instructor	Ag.Sci	**3**	*0*	**0**	*9*
	Comm.Arts	**15**	*18*	**5**	*13*
33. Solving it alone	Ag.Sci	**47**	*0*	**0**	*0*
	Comm.Arts	**10**	*0*	**8**	*0*
34. Discussing the problems/ lectures	Ag.Sci	**3**	*0*	**0**	*0*
	Comm.Arts	**25**	*0*	**0**	*0*

1. Listening to the MSC lectures mainly involves comprehending the subject content, while most listening tasks in English for Specific Purposes aim at comprehending an unfamiliar language.
2. The same difference is applied to reading. Reading in the L1 aims at comprehending major subject content and English reading mainly focuses on comprehending a foreign language

Only strategies 2 *'accessing various resources'*, 11 *'concentration in class'* and 12 *'trying to figure out main ideas'* were used both in MSC and English reading by Communication Arts students. Apart from this, students in the two discipline areas mentioned typical L2 strategies when reading, e.g., nos 20 *'consulting a dictionary'* and 26 *converting into L1'*. Communication Arts students used a wide variety of strategies and more collaborative (e.g., nos. 4, 6, 15, 32 in Table 8.20 above) to solve their reading problems in the L2. However, peer support was sought more often when reading in the MSC. Notably, strategy no. 12 *'trying to figure out main ideas'* was used by almost a quarter of the Arts students in the MSC (20 per cent) but hardly at all in the L2 (5 per cent) suggesting that reading in L2 focused on comprehension rather than analysis or that it was not done with any great commitment. These findings are consistent with the questionnaire findings (see Table 7.9) and may reflect the students' inability to generate alternative ways of ascertaining systemic features in the language and extracting the main ideas of the reading.

8.8.4 Evaluating Strategies: Use in listening & reading

Use in MSC vs English

Evaluation strategies were widely mentioned for learning both the MSC and English in the self reports. About half the students or more in **both disciplines** included nos. 2, 11, 12 and 13 (in Table 8.21 below). Strategies, such as nos. 7 *'judging how much learned'* and 13 *'detecting failure/weaknesses/problems'* were recorded by more students when listening to and reading English than the MSC. This suggests that these students saw these strategies more useful for learning another language. On the other hand, the dearth of responses for English on the equivalent use of *'summarising ideas/lessons'* (no. 6) may indicate a lack of ability to handle knowledge and ideas presented in English. This is confirmed by the students' references to their lack of proficiency, poor capability, feelings of tension and difficulty and/or failure in relation to English while performing the think-aloud tasks.

Interestingly, far larger proportions of students in these **two disciplines** used *Evaluating strategies* when reading in English. Strategies 2, 7, 11 and 13 in particular were mentioned as used when reading English.

Table 8.21 MSC vs ENGLISH- Use of evaluating process in listening & reading.

Evaluating Strategies		Use by Students (%)			
		Listening [1]		Reading[2]	
		MSC	English	MSC	English
1. Judging that the goal has been met	*Ag.Sci*	**0**	*0*	**0**	*0*
	Comm.Arts	**8**	*0*	**3**	*0*
2. Assessing strategy use	*Ag.Sci*	**62**	*35*	**6**	*24*
	Comm.Arts	**43**	*55*	**15**	*35*
3. Within subject applicability	*Ag.Sci*	**3**	*0*	**0**	*0*
	Comm.Arts	**5**	*3*	**3**	*0*
4. Other area applicability	*Ag.Sci*	**5**	*0*	**0**	*0*
	Comm.Arts	**3**	*0*	**3**	*0*
5. Seeking other suitable strategy	*Ag.Sci*	**3**	*0*	**0**	*0*
	Comm.Arts	**0**	*0*	**0**	*0*
6. Summarising ideas/lessons	*Ag.Sci*	**20**	*0*	**3**	*0*
	Comm.Arts	**22**	*0*	**10**	*0*
7. Judging how much learned	*Ag.Sci*	**32**	*53*	**3**	*50*
	Comm.Arts	**33**	*38*	**18**	*35*
8. Assessing correctness of the predictions/answers	*Ag.Sci*	**6**	*0*	**0**	*0*
	Comm.Arts	**0**	*0*	**3**	*0*
9. Comparing new knowledge with known knowledge	*Ag.Sci*	**3**	*0*	**0**	*0*
	Comm.Arts	**3**	*0*	**0**	*5*
10. Judging worthiness of learning	*Ag.Sci*	**9**	*18*	**0**	*18*
	Comm.Arts	**25**	*25*	**5**	*18*
11. Self-assessment	*Ag.Sci*	**76**	*56*	**6**	*53*
	Comm.Arts	**55**	*68*	**15**	*60*
12. Assessing learning/work	*Ag.Sci*	**68**	*47*	**0**	*26*
	Comm.Arts	**73**	*33*	**3**	*20*
13. Detecting failure/ weaknesses/ problems	*Ag.Sci*	**71**	*82*	**6**	*65*
	Comm.Arts	**68**	*83*	**18**	*63*
14. Assessing knowledge/information	*Ag.Sci*	**18**	*3*	**0**	*3*
	Comm.Arts	**25**	*15*	**10**	*13*
15. Refining ideas/skills	*Ag.Sci*	**5**	*3*	**0**	*3*
	Comm.Arts	**8**	*0*	**3**	*0*
16. Applying learning to practice	*Ag.Sci*	**3**	*0*	**0**	*0*
	Comm.Arts	**5**	*0*	**0**	*0*

1. Listening to the MSC lectures mainly involves comprehending the subject content, while most listening tasks in English for Specific Purposes aim at comprehending an unfamiliar language.
2. The same difference is applied to reading. Reading in the L1 aims at comprehending major subject content and English reading mainly focuses on comprehending a foreign language

SUMMARY

Although the self reports do not provide robust results, they do give some insight into how Agricultural Science and Communication Arts students learn the MSC and English. Informants (instructors and students) in the two disciplines were common in their control and regulation of metacognitive knowledge. They used *Monitoring* and/or *Evaluating* strategies to assess weaknesses/strength in terms of knowledge, ability, behaviours, beliefs and preferences. They measured the tasks and/or knowledge in relation to progress and/or achievement. Based on the information retrieved from monitoring or evaluation, the informants either accomplished the tasks/obstacles or avoided them. Those who reported overcoming an obstacle used strategies of either the *Planning* or *Evaluating* processes. The self reports showed anomalies between more strategic and less strategic learners, but did not show any discipline-specific strategies (e.g., between Agricultural Sciences and Communication Arts) which supports the universality of metacognitive strategies reported in the literatures.

Minimal evidence of metacognitive strategies was observed for both learning the MSC and English in the self reports. However, overall the findings from the self reports reflected what was found in the interviews and/or the questionnaires and therefore this phase of the research has triangulated data for earlier phases. For instance, not many strategies were incorporated into teaching the MSC and only weak relationship existed between incorporation of the *Problem-solving* process in teaching and instructors' perceived relevance in both disciplines.

Students in both groups also showed similarity in their tendency towards the use of strategies of every process they perceived relevant, but mention of the use of the strategies was more frequent. Other strategies were used without mentioning their relevance. This indicates a weak relationship between students' perceptions and the actual use of metacognitive strategies. Given the fact that most strategies mentioned in the self reports involve those affective control or those required by most disciplines it is not surprising that the results from self reports did not support the associations between perceived relevance and use by students found from the questionnaire data.

As found in the questionnaires, Communication Arts students were more strategic in learning both the MSC and English than their Agricultural Science counterparts. Moreover, in dealing with a problem in English, the Agricultural Science students were more likely to use avoidance strategies than students in Communication Arts. Communication Arts students also showed more cooperative learning strategies than did the Agricultural Science students.

Although the instructors did not provide information specific to listening and reading, there was some suggestions of an influence on their students' use of *Planning* and *Problem-*

solving strategies in both listening to lectures and reading. However, there was also evidence that the students developed perceptions of relevance of these metacognitive processes independently, particularly for the *Monitoring* and *Evaluating* processes.

Many more strategies were recorded in the self reports than those provided in the questionnaires, particularly for *Planning* and *Problem-solving* processes. However, most of these strategies required rather lower level metacognitive processing. In both disciplines, a greater number of strategies were noted for listening than for reading, indicating that reading received less consideration. Even though the relevance of the *Problem-solving* process was most frequently mentioned, the most commonly used processes were *Monitoring* and *Evaluating*. In learning English, strategies specific for learning a second language were frequently mentioned (i.e., *consulting a dictionary, linking with prior knowledge* and *preparing for class* strategies).

Overall evidence of association between the perceived relevance and use of *metacognitive* processes in the MSC and English was inconclusive. Even so there was evidence that the majority of students in both disciplines did not carry over the strategies at the higher metacognitive level processing, such as those used in the questionnaires.

The next chapter will present a synthesis of findings from all four approaches.

9. THE METACOGNITIVE STRATEGIES FOR EFL LEARNERS FROM THE TWO DISCIPLINES

OVERVIEW OF THE CHAPTER

This chapter combines results from the interviews, the questionnaires, the self reports and the think-aloud protocols. It responds to the research questions in terms of the similarities and differences of metacognitive strategies perceived relevant by instructors and students; used by students; incorporated into teaching by instructors, and transferred from one discipline to another. Then, comparison to previous studies on FL/SL metacognitive strategies is made.

9.1 OVERVIEW OF DATA COLLECTION

Within the two disciplines of learning at a Thai public university, methods of data collection, i.e., the interviews, survey questionnaires, self reports and think-aloud protocols were conducted. Every informant, i.e., 74 students and 10 instructors from Agricultural Sciences and Communication Arts, was requested to provide two self reports within the duration of a month and to complete a set of survey questions. All instructors and 19 students (8 Agricultural Sciences and 11 Communication Arts) also volunteered to engage in interviews and these student volunteers also performed four tasks for think-aloud protocols. These investigations provide both a broad picture of teaching and learning in the two disciplines and a more narrow focused view of students' knowledge about strategies and practices when engaging in listening and reading tasks in learning the MSC and in English.

In response to the three research questions the findings from each approach are presented in the following sections.

9.2 METACOGNITIVE STRATEGIC KNOWLEDGE & PRACTICE IN THE TWO DISCIPLINES

9.2.1 Strategic knowledge & strategy use in learning MSC

Research Question 1: Which learning strategies are students aware of in learning subject matter content? Which strategies do they perceive as relevant and does this affect their use of strategies? Do the strategies vary across disciplines?

Which strategies do they perceive as relevant and does this affect their use of strategies?

Results from different approaches to collecting data on the **perceptions of relevance** of metacognitive strategies showed that Agricultural Science students and Communication Arts students did perceive metacognitive strategies as relevant for learning the MSC. Generally students in Communication Arts perceived a wider variety of metacognitive strategies than students in Agricultural Sciences. This was evident in the questionnaire data and, to lesser extent, in the self reports.

The questionnaire data revealed that **Agricultural Science** students were more likely to see the relevance of *Monitoring strategies,* while other students in **Communication Arts** tended towards *Monitoring* and *Evaluating strategies*. More than 60 per cent of the Agricultural Science students 'agreed' or 'strongly agreed' with the relevance of 3 *Planning*, 7 *Monitoring*, 4 *Problem-solving* and 4 *Evaluating strategies* (see Appendices 9.1-9.4). Most Communication Arts students (60 per cent or more) perceived 5 *Planning*, 6 *Monitoring*, 4 *Problem-solving* and 8 *Evaluating strategies* as highly relevant (see Appendices 9.1-9.4). The two groups perceived the relevance of only 3 *Monitoring strategies* differently, i.e., *seeking related prior knowledge, checking the retrieval of required information* and *checking importance of the information.* The first, *seeking related prior knowledge*, was seen as relevant by Communication Arts students, the others were deemed relevant by Agricultural Science students.

Some of these metacognitive strategies were also mentioned as relevant in the self reports. For instance, *linking with prior knowledge*, *preparing to confront obstacles* (*Planning*); and *linking with prior knowledge* (*Problem-solving*) *strategies* were evident in Agricultural Sciences. The strategies that Communication Arts students also reported as relevant in the self reports included *directing attention selectively*, *intending to ignore distractions* and *choosing strategies for the task* (*Planning*); and *linking with prior knowledge* (*Problem-solving*).

The self reports also revealed a greater number of other metacognitive strategies (9 *Planning*, 1 *Monitoring*, 15 *Problem-solving*, 2 *Evaluating*) seen as relevant by either group or both (see Appendices 9.1-9.4). This is not surprising as they were free to write more and did not have to respond to the set in the questionnaires. However, these strategies required rather low metacognitive engagement. Most of these strategies involved environmental control, e.g., *selecting a seat*, *arriving class on time* (Planning); affective control, e.g., *effort directed* (*Planning* & *Problem-solving*), *intending to concentrate in class* (*Planning*), *concentration in class* (*Problem-solving*); or other agents, e.g., *asking for help, consulting the instructor, discussing the problems* (*Problem-solving*). Others were low metacognitive processing strategies, such as, *memorising words/information, re-reading* (*Problem-solving*).

As seen above, there were minor discrepancies between the perceptions of relevance of strategies which occurred between the two groups of students. The questionnaire data showed that proportions of 'per cent agreement' varied for the relevance of 16 out of the 40 individual strategies, including 3 *Planning,* 5 *Monitoring,* 3 *Problem-solving* and 5 *Evaluating*. Significant differences of perceived relevance between students in the two groups, based on *Mann-Whitney U tests,* existed for only the *Planning* process. This is confirmed by the self report data in that 10 different *Planning strategies* were mentioned as relevant to the Agricultural Sciences (i.e., *goal setting, linking with prior knowledge, preparing to confront obstacles, spending extra time to study/practice* and *effort directed*) and Communication Arts (i.e., *directing attention selectively, intending to ignore distractions, choosing strategies for the task, making a plan* and *intending to concentrate in class*).

For **strategy use**, both group of students, according to the data from the interviews, the self reports and the think-aloud protocols, provided information about the interaction of the four metacognitive **processes** that was consistent with the conceptions underlying this study (see Figure 1.2).

When **listening and reading in the MSC**, students identified in the self reports their intention (*Planning*) to do something or monitored their comprehension or behaviour (*Monitoring*). Some checked the progress of on-going tasks (*Monitoring*). In the case where obstacles/weaknesses were detected (*Monitoring*), the students showed their intention to plan (*Planning*) or tried to overcome the difficulties (*Problem-solving*). They also assessed what they had done or gained (*Evaluating*). If any failure or weakness was found (*Evaluating*), they identified how they solved it (*Problem-solving*) or intended to improve themselves (*Planning*). The interaction of these processes revealed evidence of their motivation and/or positive attitudes if they were pleased with what they had done. On the other hand, avoidance strategies or doing nothing was also found and equated with students' lack of motivation particularly for learning English. However, these students also recognised the negative consequences of such behaviours and most mentioned the need to change their habits. Generally, students in the two groups were not discouraged by their weaknesses, insufficient knowledge and technical skills, failure or ineffective of strategies used when learning the MSC. The knowledge about strategies they possessed, as reported in the interviews and self reports, helped them to cope with independent learning tasks in their major subject content without much difficulty. This supports the influence of metacognitive engagement on learners' confidence, willingness and ability to take responsibility for their choice (Dole & Sinatra, 1998; Littlewood, 1996; Zimmerman, 1995) and to transfer their knowledge across learning tasks within their area of study (Georghiades, 2000; Hamman et al., 2000).

This study also confirms the assertion by Chamot et al (1999) in that students in the two groups reported using strategies of the *Planning* process before attending an MSC class or for accomplishing an MSC learning task. These students used *Monitoring* strategies to check their learning/task or affective and/or cognitive states in response to the on-going task. *Problem-solving* strategies were used when monitoring/evaluation informed an individual of any obstacle or weakness. *Evaluating* strategies were activated at the completion of the learning or the task.

In terms of **individual strategies**, more than 60 per cent respondents in the two groups reported the highly frequent use of 23 strategies from the questionnaires (see Appendices 9.1-9.4). These and other strategies from the questionnaires were also reported as used for either listening or reading or both in the self reports and the think-aloud protocols. From the questionnaire data, Agricultural Science students frequently used only 3 of these strategies, i.e. 2 *Monitoring – directing attention selectively, checking the attention*; and 1 *Evaluating – judging worthiness of learning*. The most frequently used strategies by students in Communication Arts were *Evaluating* (9 strategies) and *Monitoring* (6 strategies). Only 4 *Planning* and 4 *Problem-solving strategies* were reported as frequently used for the MSC by students in Communication Arts. The use of these metacognitive strategies were also observed in the self reports and the think-aloud protocols. Interestingly, one of these *Problem-solving strategies – revising the plan*, was not confirmed by either the self report data or the think-aloud data. These students might have not yet developed the strategy or did not use it without guidance.

The **self reports and the think-aloud protocols** also revealed additional metacognitive strategies that students in the two disciplines used for learning the MSC, when listening or reading or both. They were 13 *Planning*, 3 *Monitoring*, 22 *problem-solving* and 5 *Evaluating strategies* (see Appendices 9.1-9.4). The *Monitoring strategies* included *self-examination*, *distinguishing appropriateness from inappropriateness* and *note-taking*. The *Evaluating strategies* were *assessing learning/work, detecting failure/weaknesses/problems, assessing knowledge/ information, refining ideas/skills, self-assessment* and *applying learning to practice*. As in the case of perceptions of relevance, the strategies used when planning and dealing with an MSC problem involved controlling the environment (e.g., *preparing for class, arriving class on time, selecting a seat*), controlling affective states/activities (e.g., *effort directed, intending to concentrate in class, suppressing distractions/inappropriate thoughts*), managing resources (e.g., *accessing various resources, spending extra time to study/practice, asking for help, extra reading, peer support*) or other low metacognitive processing (e.g., *reviewing the notes*, *memorising words/information, re-reading*).

Comparing metacognitive strategy use between **Agricultural Sciences and Communication Arts**, significant differences of use were found in the questionnaire data for the *Planning* and *Evaluating* processes. These significant differences between their strategy use, using *Gamma coefficients,* were found for 6 of the 28 highly used strategies, i.e., 1 *Planning,* 2 *Problem-solving* and 3 *Evaluating*. In the self reports and think-aloud data, there was mention of strategies used only in one discipline or another, but the evidence was not robust. The only strategies that Agricultural Science students reported in the self reports as using were *extra reading* and *spending extra time to study/practice* (*Planning*) and *adjusting methods/techniques*, *seeking ways for improvement/making revision* (*Problem-solving*). Only one *Planning strategy – making a time frame* was used by only Communication Arts students.

A difference between the two disciplines in the use of some individual strategies therefore did occur, but the evidence was insufficient to make any definite conclusion about which strategies are specific to one discipline or the other. Even so, some tendency towards the use of different kinds of strategies in dealing with problems when learning the MSC was observed. For instance, Agricultural Science students tended towards dealing with a problem alone, i.e., *solving it alone, looking for solutions, trying alternatives*, but students in the Communication Arts preferred cooperative strategies (e.g., *peer support, consulting the instructor, discussing the problem*, *working it out in a group*). However, students in Agricultural Science were more likely to use avoidance strategies and to *give up* more easily than their Communication Arts peers. One avoidance strategy of the *Problem-solving* process from the questionnaires (*ignoring problems*) was also more frequently recorded in self reports and was used significantly more by Agricultural Science students. Evidence from both instructors and students through the interviews and the self reports is sufficient to suggest that this was a consequence of the more instructive teaching in this field.

In terms of the **relationship between perceptions of relevance and use**, students in the two disciplines commonly showed that their use of metacognitive strategies related highly to their perceptions of relevance. This occurred in particular among the Communication Arts students. That is, they frequently used strategies that they saw as relevant when learning the MSC and rarely or did not use the strategies they did not see as relevant. For instance, Communication Arts students frequently saw as relevant and used 5 *Planning*, 9 *Monitoring*, 6 *Problem-solving* and 9 *Evaluating strategies*. Only two of these *Planning strategies* were similar to those found in Agricultural Sciences. The **questionnaire** data also showed 15 strategies that Agricultural Science students frequently perceived as relevant and used. These included 2 *Planning* (*preparing to confront obstacles* and *work ordering*), 5 *Monitoring* (*checking progress, detecting weaknesses/obstacles, checking the retrieval of required information, checking the attention* and *checking importance of the information*), 3 *Problem-solving* (*revising the plan, trying alternatives* and *self-encouragement*) and 5 *Evaluating* (*judging that the goal has been met, other area applicability, summarising lesson, comparing new knowledge with known knowledge* and *judging worthiness of learning*). The three

Problem-solving strategies were also used in Communication Arts. The strategy that Agricultural Science students rarely used and saw as least relevant was *predicting outcomes/answers* (*Planning*). The strategy least likely to be used or seen as relevant by Communication Arts was *ignoring problems* (*Problem-solving*).

The questionnaire data also revealed that students, in Agricultural Sciences in particular, were less likely to use some strategies even though they perceived them as highly relevant (e.g., *goal setting, linking with prior knowledge – Planning; seeking related prior knowledge, checking appropriateness of the strategy being used* and *checking linkage to other subjects – Monitoring; linking with prior knowledge – Problem-solving* and *(assessing) strategy suitability & effectiveness and within subject applicability -- Evaluating*). This suggests that the students in this discipline need to be trained in actually using these metacognitive strategies. Conversely, one *Problem-solving strategy* (*seeking peer support*) was frequently used even though many students did not rate its relevance. This indicates that these students were able to use the strategy independently.

The findings above were consistent across the **self reports and the think-aloud protocols**. For instance, some strategies were recorded as both using and perceived as relevant, for example, *Planning* (e.g., *goal setting, linking with prior knowledge* and *preparing to confront obstacles* – in Agricultural Sciences; and *directing attention selectively, intending to ignore distractions* and *choosing strategies for the task* – in Communication Arts), *Problem-solving* (i.e., *asking for clarification, linking with prior knowledge* – in both disciplines) and *Evaluating* (i.e., *summarising ideas/lessons, judging how much learned* and *judging worthiness of learning* – in Communication Arts). Other strategies were reported as used without mention their relevance, particularly for *Monitoring* (e.g., *seeking related prior knowledge, checking the retrieval of information, checking the attention, checking the appropriateness of the strategy being used, checking importance of the information, checking correctness of the predictions/answers* – in both disciplines) and most other *Evaluating strategies*, except the 3 strategies mentioned earlier.

Which learning strategies are students aware of in learning subject matter content?

This study shows that knowledge about metacognitive strategies held by students in Agricultural Sciences and Communication Arts ranged from lower to higher metacognitive processing and that different strategies were used to assist learning the MSC. The use of metacognitive strategies related highly to perceptions of relevance, particularly among Communication Arts students. There was strong evidence that these students had developed some metacognitive strategies, particularly *Monitoring* and *Evaluating strategies*, and used them in learning the MSC independently.

Communication Arts students reported using a wide range of strategies and using them more frequently than their counterparts in Agricultural Sciences. As mentioned earlier, more than 60 per cent of students in the Communication Arts rated the frequent use of 22 strategies in the questionnaires, while only 3 of these strategies were used frequently by the majority of Agricultural Science students (at least 60 per cent). According to the proportion of responses in the self reports and the questionnaires, students in Communication Arts also tended to be more flexible in using metacognitive strategies in learning the MSC. Greater reference was made to *Planning* and *Problem-solving strategies* in the Communication Arts students' self reports (see Appendices 9.1 and 9.3). Therefore, the interviews and the self reports showed that Communication Arts students were more independent in learning the MSC.

A difference between the two disciplines in the use of some individual strategies did occur, but the evidence was not sufficient to make any definite conclusion about which strategies are specific for one discipline or the other. Agricultural Sciences students seem to deal with a problem alone while their Communication Arts peers were likely to use cooperative strategies. However, Agricultural Science students were likely to give up more easily. Therefore the striking difference between the two groups of students was the tendency for Communication Arts students to be more strategic than their Agricultural Science counterparts. They reported using a wider variety of strategies and showed more independent learning in the MSC.

Comparing listening and reading, a closer look into the tasks of the MSC reveals a difference between the two disciplines in their perceptions of relevance for listening but not for reading. In the self reports, some strategies were reported as used only for one task or another indicating that different tasks demanded different strategies. The commonly used strategies for listening included *preparing for class, arriving class on time, selecting a seat and thinking in advance about/discussing the topic* (*Planning*); *checking correctness of the predictions/answers* and *distinguishing appropriateness from inappropriateness* (*Monitoring*); *linking with prior knowledge, discussing the problem; doing nothing and responding in class* (*Problem-solving*) and *applying learning to practice* (*Evaluating*). Only a minority of students in both fields made reference to metacognitive strategies for reading but some of these strategies were not used when listening to lectures, for example, *making a plan* (*Planning*); and *pre-reading* (*Problem-solving*).

9.2.2 Influence of instructors and their strategy instruction

> **Research Question 2**: Do instructors in the given disciplines perceive certain metacognitive strategies as relevant to learning independently in the disciplines? If so, how does this perceived relevance affect their teaching of these strategies to their students?

With reference to **perceptions of relevance**, according to data from the questionnaires and the self reports, instructors in Agricultural Sciences, perceived more metacognitive strategies as relevant to learning the MSC than the Communication Arts instructors. That is, at least 3 out of the 5 instructors in the Agricultural Sciences 'agreed' or 'strongly agreed' with the relevance of 25 individual strategies as opposed to 18 in Communication Arts. While instructors in Agricultural Sciences rated or recorded the relevance of a greater number of *Monitoring, Problem-solving* and *Evaluating strategies*, the same number of instructors in Communication Arts reported the relevance of a greater number of *Planning strategies*. The instructors in the two disciplines shared a common view on the relevance of 13 of these strategies (1 *Planning* –no.10 in Appendix 9.; 1 *Monitoring* – nos. 5 in Appendix 9.2; 6 *Problem-solving* – nos. 1, 2, 4, 5, 6 and 23 in Appendix 9.3; and 5 *Evaluating strategies* – nos. 1, 4, 6, 7 and 10 in Appendix 9.4). In addition, no significant differences were found for the instructors, either in their perceptions of relevance or incorporation in teaching of metacognitive strategies. This might be caused by the small number of the participants.

The majority of instructors in both groups reported **incorporating** a similar number of strategies of each process into their teaching. For instance, 10 *Planning* , 11 *Monitoring*, 10 *Problem-solving* and 12 *Evaluating strategies* were frequently rated as explicitly taught in Agricultural Sciences, while 12, 9, 7 and 11, respectively, were taught by Communication Arts lecturers. The instructors in both disciplines were common in their inclusion of *Evaluating strategies* (nos. 1, 2, 5, 6, 7, 10, 11 and 16 in Appendix 9.4) and *Monitoring strategies* (nos. 2, 4, 5, 6, 8 and 9 in Appendix 9.2). However, only 4 *Problem-solving strategies* (nos. 1, 4, 5 and 10 in Appendix 9.3) were included in the teaching of either discipline. The least commonly included strategies were *Planning* (nos. 13 and 16 in Appendix 9.1)

The qualitative data showed that some lecturers only implicitly taught strategies giving no explicit explanation of them. With the more explicit teaching of the strategies, however instructors reported introducing their advantages and encouraging students to use them. For example, when including *Planning strategies*, instructors would encourage their students to prepare for a task or a practical session. Some instructors required students to make a plan and/or a timeframe for their tasks. This is also the case for *Monitoring strategies*. Most instructors reported checking learners when performing a task or encouraging them to check their own learning/work. Some instructors even reported introducing *Monitoring* directly and providing opportunities for students to practise them. Likewise, there was evidence that *Evaluating strategies* were firmly embedded in teaching and learning in these disciplines. All instructors referred to giving consultations or solving problems for their students by assessing students' work to check improvement and give feedback. Some claimed that they told their students or directly led them to practise evaluating their tasks and skills themselves. Given the relatively few *Problem-solving strategies* that instructors in the two fields rated or mentioned, it seems that this metacognitive skill was either assumed or not of concern.

Generally, therefore **instructors in the two fields** provided opportunities for learners to practise the metacognitive processes alone. However, in many cases instructors in the Agricultural Sciences were likely to give assistance to their students or even take full responsibility of planning, monitoring and/or evaluating their students' learning or practical sessions. Such highly instructive teaching was reflected in students' responses. Although these students were well informed with positive perceptions of the relevance of many strategies, they seemed to struggle when applying many strategies or were inclined to give up more quickly than their Communication Arts counterparts. This supports previous research with high school and college students that suggests "less instructive guidance [in metacognition] is more effective for students" (Dominowski, 1998, p. 43) to promote metacognitive strategy use.

Some results of strategies incorporated implicitly in teaching, i.e., without mentioning their relevance or otherwise, suggests that the incorporation of metacognitive strategies was not always related to instructors' perceptions of relevance. The significant **relationships between perceived relevance and incorporation** were found for only one process (*Evaluating*) in Agricultural Sciences and for only a limited number of individual strategies of each process (see section 5.7).

These results might explain why the students had no problem in applying *Monitoring* and *Evaluating* processes, but had not developed the higher order thinking strategies of *Planning* and *Problem-solving*, and were unable to transfer them effectively across the tasks or subject areas. As seen in Appendices 9.1-9.4, even though students in both fields reported using higher order metacognitive strategies (from the questionnaires, e.g., *goal setting, predicting outcomes/answers, choosing strategies for the task, trying alternatives*), in their self reports and/or in the think-aloud protocols, the response was rather weak and some reported using them mainly for either listening or reading.

Again, only tentative conclusions relating **instructors' and students'** responses are possible in this study because of the size of the cohorts. Commonality between metacognitive strategies perceived as relevant by both instructors and students and between those incorporated in teaching and those used by students points to the possibility of instructors influencing their students' choices. The highly instructive teaching in the Agricultural Sciences seems to result in many students' avoidance or giving up more easily, even though they are more consistent in their perceptions of strategy relevance and strategy use across the two learning areas than their Communication Arts peers. Nonetheless, the results from the self reports and the questionnaires do indicate, to some extent, that the students in both groups have developed their own knowledge about metacognitive strategies and used them independently of their instructors' advice.

In conclusion, evidence from the interviews, the questionnaires and the self reports reveals that overall instructors in these two fields perceived the relevance of some strategies of the four metacognitive processes in learning the MSC. In order to prepare their students to be self-reliant other strategies were incorporated into teaching regardless of whether their relevance was mentioned. The incorporation of these strategies was rather implicit than explicit. There are, therefore, only tentative conclusions that can be made about the relationship between instructors' perceptions of relevance of metacognitive strategies, the incorporation of these strategies in teaching and the subsequent influence on students' learning.

9.2.3 Transfer of Metacognitive Strategies from the MSC to English

> **Research Question 3**: Which metacognitive strategies, if any, do students transfer from learning the subject discipline to learning English? Which strategies do they need to be trained in in order to be able to learn English independently?

As is evident in the questionnaire data, there were limited numbers of metacognitive strategies seen as relevant or used for learning both the MSC and English. Generally, Agricultural Science students were more consistent than their Communication Arts peers in their knowledge about the relevance of strategies and their strategy use for learning both the MSC and English (i.e., situations where both the percentages and the *tau-b* were ≥ 0.50).

There were 15 metacognitive strategies in the questionnaires that were seen as **relevant to both areas** of study by Agricultural Science students. They included 2 *Planning* (i.e., *linking with prior knowledge, intending to ignore distractions*), 4 *Monitoring* (*detecting weaknesses/ obstacles, seeking related prior knowledge, checking the attention and checking the importance of the information*); 4 *Problem-solving* (*revising the plan, trying alternatives, logic reasoning, logic reasoning and self encouragement*) and 5 *Evaluating* (*judging that the goal has been met*, *(assessing) strategy suitability & effectiveness, summarising ideas/lessons* and *comparing new knowledge with known knowledge*). There were only 9 metacognitive strategies that Communication Arts students saw as relevant for both subject areas. They included 1 *Planning strategy – linking with prior knowledge* and 4 *Monitoring strategies – comprehension check, detecting weaknesses/obstacles, checking the retrieval of expected information and checking the appropriateness of strategy being used*; 1 *Problem-solving strategy – self-encouragement* and 3 *Evaluating strategies* (*(assessing) strategy suitability & effectiveness, summarising ideas/lessons and judging that the goal has been met strategy*). Only one *Planning strategy* (*linking with prior knowledge*) was confirmed in the self reports. This suggests either that the requirement of high metacognitive processing or the limitations of the self report and the think-aloud protocol data collection methods were quite challenging for these students.

For actual **strategy use**, the **questionnaires** showed that fewer numbers of metacognitive strategies were carried over the two areas of study by students in the two groups. Agricultural Science students used 7 strategies for both the MSC to English (i.e., *work ordering – Planning*; *checking progress detecting weaknesses/obstacles and checking the attention – Monitoring*; *seeking peer support and self-encouragement – Problem-solving*; and *comparing new knowledge with known knowledge – Evaluating strategies*). Communication Arts students used only 4 metacognitive strategies (i.e., *comprehension check and checking appropriateness of the strategy being used – Monitoring*; *self-encouragement – Problem-solving*; and *judging worthiness of learning – Evaluating*) for both the MSC and English. Once again, there was no evidence in either the self reports or the think-aloud protocols to confirm that Agricultural Science or Communication Arts students used these strategies in both subjects. In fact, these results showed quite the opposite in that there was evidence in the self reports and think-aloud protocols that the students in both disciplines reported either the relevance and/or use of strategies in learning English but not in learning the MSC. These strategies included, for example, *rehearsing, consulting a dictionary, keeping a vocabulary list, converting into L1*.

Apart from confirmation of the relevance and/or use of strategies in the questionnaires, data in the **self reports** showed that both groups of students perceived the relevance of 15 additional metacognitive strategies for both the MSC and English. They were 3 *Planning*, i.e., *preparing for class* (in both disciplines), *selecting a seat* (in Agricultural Sciences) and *pre-reading*; 1 *Monitoring – note-taking* (in both disciplines) and 11 *Problem-solving strategies*. More *Problem-solving strategies* were provided by Communication Arts students (11 strategies) than their Agricultural Science counterparts (5 strategies). The 5 strategies they shared included: *effort directed, looking for solutions, concentration in class, reviewing the lessons/notes and spending extra time to study/practice*.

The two groups of students showed close similarity in their self reports in the use of additional metacognitive strategies for both learning the MSC and English (4 of the 7 *Planning*; 2 *Monitoring*; 13 of the 18 *Problem-solving* and 4 out of the 5 *Evaluating strategies* in Appendices 9.1-9.4). The *Planning strategies* that the students in Agricultural Sciences and Communication Arts commonly recorded were *pre-reviewing concepts, thinking in advance about/discussing the topic, pre-reading* and *reviewing the notes/vocabulary list*. The 2 *Monitoring strategies* were *self-examination* and *note-taking*. The *Problem-solving strategies* involved *effort directed, asking for help, consulting the instructor, concentration in class, trying to figure out main ideas, doing nothing, suppressing distractions/inappropriate thoughts, reviewing the lessons/notes, spending extra time to study/practice, directing attention* *selectively, making understanding clear, re-reading* and *working it out in a group*. The *Evaluating strategies* that these two groups of students used for both the MSC and English were *assessing learning/work, detecting failure/weaknesses/problems, assessing knowledge/ information* and *self-assessment*. The common use of *Monitoring* and *Evaluating strategies* across learning tasks and areas of study demonstrated in this research provides additional strategies to Chamot and O'Mally (1987) who argue that directing attention selectively, self-monitoring and self-evaluation strategies are universal to every type of learning task.

Although Communication Arts students provided stronger understanding of strategies with relevance and use attributed to more metacognitive strategies in learning the MSC and English, their Agricultural Science peers showed a transfer of a greater number of metacognitive strategies across the MSC and English. The strategies that were only carried over by Agricultural Science students included 1 *Planning – spending extra time to study/practice*; 3 *Problem-solving – trying to resume concentration*, *responding in class* and *giving up*; and 1 *Evaluating – refining ideas/skills*. The strategies that were only evident in the Communication Arts were 2 *Planning – arriving class on time* and *selecting a seat*; and 2 *Problem-solving – extra-reading* and *memorising words/information*.

With regard to **listening and reading**, even though the evidence of transfer was not sufficient to conclude that there were specific metacognitive strategies for listening or reading in the MSC (the L1) and English (the L2), there was, some evidence of a transfer of use across the two subjects for some strategies which may also suggest task specificity. The self reports and think-aloud protocols revealed that some strategies were perceived as relevant and/or used for listening but not for reading (e.g., *preparing for class, selecting a seat, thinking in advance about/discussing the topic – Planning*; *checking the retrieval of required information – Monitoring*; *linking with prior knowledge, looking for solutions, doing nothing, trying to resume concentration – Problem-solving*; *within subject applicability, refining ideas/skills – Evaluating*). A few were used for reading but not for listening e.g., *trying to figure out main ideas, re-reading – Problem-solving*, *checking importance of information – Monitoring*. This supports the assertion of some scholars, such as Vogely (1995) and Rubin (1994), that to accomplish listening and reading might require different set of strategies.

The self reports and the think-aloud protocols revealed a more significant difference between how metacognitive strategies were used when learning the MSC and English. Contrary to the MSC, where metacognitive processes were used in English listening and reading until a problem was solved or the informant was satisfied, relatively few students reported using all the four or three processes (*Planning* then *Problem-solving* and/or *Evaluating*). In most cases, students identified only *Monitoring* or *Evaluating* when reading and listening to English. When monitoring or evaluating learning in English, students detected obstacles/weaknesses or realised their own limitations, capabilities or preferences. Rarely did they plan to improve their comprehension or describe how they would overcome their English listening or reading problems (see Figure 9.1). The absence of transfer of *Planning* and *Problem-solving strategies* here might be, as Walter (2004) explains, affected by L2 proficiency or lack of confidence (Littlewood, 1996). Similarly, in this study all students identified their positive or negative affective responses to these *Monitoring* and *Evaluating strategies*. This might also be indicative of students having a limited list of effective strategies to rely on.

Mostly, for the MSC, regardless of difficulties or disappointments, the students showed the confidence and/or the incentive to cope with challenging tasks or to put effort into overcoming problems (see also Figure 1.2) but this is not the case for learning English. This research shows that most students suffered from poor English skills, stress and uninteresting learning tasks. The weaknesses in language and linguistic features that they reported included limited vocabulary, poor syntax and grammatical knowledge, lack of familiarity with accents and the speed of connected speech. Their classroom English learning tasks focused on rote learning such as, memorising words and word meanings as well as constant grammatical practice which created stress, negative attitudes and lessened their willingness to be responsible for their own learning. Nonetheless, a number of students maintained strong positive attitudes and were willing to spend extra time studying/practicing in order to improve their English proficiency, however they reported that they had no idea how to study English alone. This resulted in a tendency to give up and limited the likelihood of their learning English independently.

Figure 9.1 (below) models the consequences of insufficient/transfer of knowledge about strategies (stored in long term memory) and the absent or inadequate application of metacognitive strategies to actual practice, particularly *Planning* and *Problem-solving* (denoted by a 3-dimensional arrow at the top right of the figure), which prevented students from learning to listen to or read in English independently. In learning English, when students detected their weaknesses/obstacles with *Monitoring* (the two headed arrows with shadow) and *Evaluating strategies* (the two headed and dashed arrows) many became discouraged or tended to give up after trying only a few *Problem-solving strategies* (denoted by the 3-dimensional arrow at the top left of the figure). For example, the data shows that relatively few *Problem-solving strategies* were used and these were not of a high metacognitive level, e.g., *memorizing words/information, asking for help, seeking peer support*. In addition, some students reported (in the self reports) the intention to do extra reading, consult a dictionary before class or take an intensive English course (*Planning*), but did not actually pursue their plans (*Problem-solving*). Therefore, the newly acquired knowledge to be stored in long term memory was rarely mentioned in their self reports and the think-aloud protocols. Both Agricultural Science and

Communication Arts students still seemed to rely on other agents to listen to or read English and generally lacked initiative when doing tasks in English.

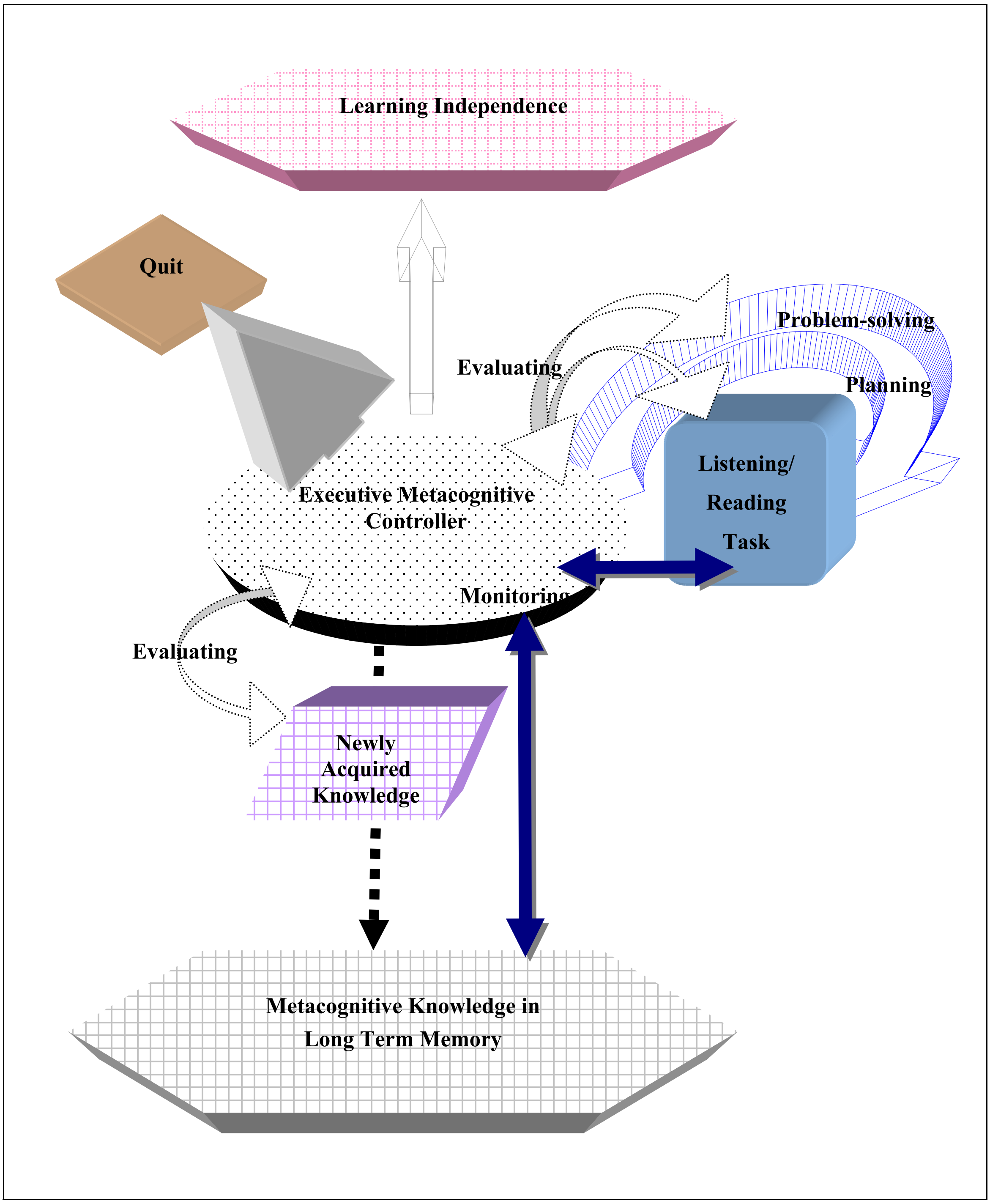

Figure 9.1 The interaction of metacognitive processes when listening/reading in English.

Compared with a model of MSC process use (in Figure 1.2), when students detected their weaknesses/obstacles (*Monitoring/Evaluating strategies*) they either planned (*Planning*) or tried to overcome the difficulties (*Problem-solving*). Many students in both disciplines showed that they were willing to and cope with their own learning in their MSC and, as a result, there was newly learned knowledge to be stored in long term memory for future use.

The recursivity of these processes (Chamot, Barnhardt, El-Dinary, & Robbins, 1999) was also observed in the order of strategy use, similar to Young (1997). While Young (1997) provides a series of individual strategies that EFL listeners use, this study reveals a pattern in the use of the four processes. One listening strategy pattern, found by Young (1997) is "Inferencing to guess the theme or topic of the text or Elaboration to activate their prior knowledge of the topic they had been listening to" and "Summarisation to reinforce their own interpretation of the text" (p.49). The other is "Self-monitoring/Self-evaluation" and "Feedback" – "giving comments about the aural text" (p.49-53). This study reveals that listening or reading strategies start with *Monitoring* or *Evaluating strategies* and are then followed by *Planning* or *Problem-solving strategies*. Some students mentioned their intention to do something (*Planning*), to check on-going activities (*Monitoring*) or to deal with a difficulty (*Problem-solving*). Some used *Evaluating* and then *Planning/Problem-solving* or both. For instance, many students repeated *Monitoring/Evaluating* in their plans or when solving problems and then in *Problem-solving/Planning*. This cycle of processes was reapplied (in relatively few cases) until the students were satisfied or they had completed the task (see also sections 1.2.2 and 2.3.3).

In general, results from all approaches reveal that students in Agricultural Sciences and Communication Arts perceived strategies of the four processes of *Planning*, *Monitoring*, *Problem-solving* and *Evaluating* as relevant to their learning in the MSC and used them in learning their major subject content. The perceptions of relevance and strategy use were sufficient for them to be able to take charge of their own learning for the MSC. However this was not the case for learning English. Few students in these two disciplines transferred their knowledge about metacognitive strategies from learning the MSC to learning English. Although there was evidence that many strategies of each process were used for both learning the MSC and learning English, the responses were not strong. Relatively few strategies of each process received high 'per cent agreement' and high *tau-b* coefficients.

The failure to use the higher order thinking strategies of the *Planning* and *Problem-solving* processes seems to prevent these students from becoming independent learners in English. The assertion of Davidson and Sternberg (1998) that effective problem-solvers spent more time on planning and exercise more control over the *Planning* process consolidates the need demonstrated by this research for students in these two groups to be trained in *Planning* and *Problem-solving*.

In order to help students from Agricultural Sciences and Communication Arts learn English independently, a list of metacognitive strategies is recommended based on the findings mentioned above.

9.3 SUGGESTED METACOGNITIVE STRATEGY LIST FOR LEARNING ENGLISH

The majority of students did not report using higher level strategies (e.g., *Planning* and *Problem-solving*) so the list includes these as desirable strategies to teach students to use when learning English. The desirable list in Table 9.1 (below) also includes those strategies which do work (e.g., *Monitoring* and *Evaluating*) and those strategies which are mandatory to learning a language (e.g., Chamot, 1993; Sparks & Ganschow, 1993; Vogely, 1995; Walter, 2004; Waugh, Bowering et al., 2005b).

Table 9.1 A list of suggested metacognitive strategies for students in Agricultural Sciences & Communication Arts.

Planning	1. Goal setting 2. Pre-reviewing concepts 3. Expecting the encountered problem 4. Predicting outcomes/answers	5. Predicting the incoming information 6. Choosing strategies for the task 7. Work ordering	8. Making a time frame 9. Managing resources 10. Accessing various resources
Monitoring	1. Checking progress 2. Seeking related prior knowledge 3. Checking the retrieval of required information 4. Checking the attention	5. Checking appropriateness of the strategy being used 6. Checking correctness of the predictions/answers 7. Note-taking selectively	8. Checking the linkage to other subjects 9. Checking importance of the information 10. Self-examination
Problem-solving	1. Revising the plan 2. Accessing various resources 3. Tolerating incomprehension 4. Managing resources 5. Linking with prior knowledge 6. Inferencing 7. Elaboration	8. Using context clues 9. Using knowledge about the topic 10. Using knowledge about genre 11. Using knowledge about grammar & syntax	12. Using knowledge about Phonology & Phono- -logical segmentations 13. Making understanding clear 14. Trying to figure out main ideas
Evaluating	1. Judging that the goal has been met 2. Assessing strategy used 3. Within subject applicability 4. Other area applicability 5. Seeking other suitable strategy 6. Assessing knowledge/ information	7. Comparing new known with known knowledge 8. Judging how much learned 9. Summarising ideas/ lessons 10. Assessing correctness of the predictions/answers 11. Assessing learning/work	12. Judging worthiness of learning 13. Refining ideas/skills 14. Applying learning to other practice

The lack of use or transfer of these higher order strategies, such as most *Planning* and *Problem-solving strategies* in the questionnaires, means that their inclusion in the list of desirable strategies for language learning is important. As seen in the previous section, when planning or dealing with comprehension problems in particular, the students in these two fields reported using bottom up strategies such as referring to familiar words, using grammatical knowledge (*Problem-solving*). Relatively few strategies were top down (such as linking with prior knowledge) or at the high metacognitive level (such as the pre-selected strategies used on the questionnaires). Even though *Monitoring* and *Evaluating* were used by students in both Agricultural Sciences and Communication Arts their use did not help them learn English independently. The findings on the inclusion of metacognitive strategies in this study point to the benefits of teaching of the "what" the strategy is and "why" the strategy should be learned (declarative knowledge); "how" to use the strategy (procedural knowledge); "when and where" to use the strategy; and "how to evaluate its effectiveness" (conditional knowledge) (Carrell et al., 2001, pp.232-233; Kluwe, 1982, p. 212; 1987, p. 31). This suggests the need to give explicit training to these students in all the four metacognitive processes.

For *Planning* and *Problem-solving* processes in Table 9.1, some strategies in this list have broader meaning. For instance, the strategies that students in the Agricultural Sciences and Communication Arts actually used in planning and/or dealing with comprehension problems involved the control and regulation of their affective states and activities, e.g., *intending to ignore distractions/inappropriate thoughts*, *concentration in class*; and other agents or materials such as a dictionary, a glossary, a textbook, or a vocabulary list/note. In the above list, affective control strategies are included under *managing resources* and strategies involving other agents or materials are coded as *accessing various resources*. The *'managing resources strategy'* was mentioned in interviews and self reports and referred to the way students selected, arranged and/or managed knowledge/information from different sources. These activities demand high level metacognitive processing. The *accessing various resources strategy* in Table 9.1 involves outside resources. This strategy was used more extensively than reported by the informants in this study, and involves only documents and resources, for example at the work place.

Some strategies have been replaced to make the meaning clear. For example, pre-reviewing concepts (*Planning* no. 2 in Table 9.1) is suggested instead of linking with prior knowledge strategy as both mean using knowledge/concepts relevant to the task. The concepts here involve knowledge about linguistic features, strategies, the world and the learner him/herself that are required for accomplishing the task. In the *Problem-solving* process, ignoring problem is replaced by *tolerating incomprehension* (Chamot & O'Malley, 1994). In place of *making (new) guesses* and *logic reasoning* are strategies that allow learners to make guesses effectively such as using context clues, inferences and elaboration (Chamot, Barnhardt, El-Dinary, & Robbins, 1999; Chamot & Kupper, 1989; Robbins, 1996; Rubin, 1994; Walter, 2004; Young, 1997).

Some strategies such as *linking with prior knowledge, looking for solutions, spending extra time studying/practising* were reported as used by a greater number of students when listening in English, but by fewer students for the MSC. The opportunities to apply these strategies both within English learning and across subject areas should be addressed.

Also included in the list are further strategies of the *Problem-solving* process which are mandatory for language learning. These include using knowledge about phonology & phonological segmentation (Chamot, 1993; Sparks & Ganschow, 1993; Walter, 2004), using knowledge about genre of the text (Waugh, Bowering et al., 2005b), using knowledge about words, syntax & grammar (Vogely, 1995).

This study revealed that all *Monitoring* and *Evaluating strategies* mentioned in the self reports and the interviews were similar to the successful strategies used in the questionnaires and the think-aloud protocols. Because they were used successfully by students in the MSC but not in English, they are included in the list of desirable strategies. Additional strategies such as *assessing knowledge/information, assessing learning/work, applying learning to other practice* (*Evaluating*) were observed in the self reports and think-aloud protocols are included as these strategies help motivate learners in learning the MSC but not in English. What, why, how and when to use the strategies should be explicitly taught to these groups of students. Only *comprehension check* and *detecting weaknesses/obstacles* of *Monitoring* and *self-assessment* and *detecting weaknesses/failure/problems* of the *Evaluation* process in the two fields was used automatically across domains by most students so have been omitted.

Finally, to accomplish listening or reading tasks in both areas of study, some strategies were preferred over others. When accomplishing a listening task, the students in Agricultural Sciences and Communication Arts tended to be more flexible in using metacognitive strategies than when performing a reading task. This might be because listening to lectures is embedded firmly in teaching and learning their MSC. The reluctance to do extra L1 reading and the high level of proficiency of undergraduate students in their L1 might not make them aware of the need to use different strategies when reading in the L2. The fact that listening to a FL/SL is always more challenging than reading for language learning beginners (Dejean de la Batie, 1993 as cited in Rubin, 1994) might also explain why these students recorded a greater number of strategies for listening.

SUMMARY

This chapter has combined results from all the research approaches employed in this study and addresses the research questions. Regarding the perceptions of relevance and strategy use, students in Agricultural Sciences and Communication Arts had common views on strategy relevance when learning their major subject content. Even though a greater number of strategies and responses were observed for the Communication Arts students than for those studying Agricultural Sciences, no significant difference was found. Some different types of the Planning and Problem-solving were observed, but the evidence was not sufficient to conclude which strategies were specific to one discipline or another. The instructors in these two disciplines were common in the strategies they saw as relevant to learning the MSC and the strategies they incorporated into teaching. A minor difference was found with reference to a greater number of strategies and more instruction of the metacognitive strategies made by Agricultural Science instructors. In terms of transfer of perceptions of relevance and strategy use from the MSC to English, the majority of students in both disciplines did not carry over the strategies at the higher metacognitive level, such as those used in the questionnaires. Drawing on the findings of this research and on previous studies on learning strategies used by successful FL/SL learners, a list of desirable metacognitive strategies has been provided for explicitly teaching students.

10. CONCLUSIONS & RECOMMENDATIONS

OVERVIEW OF THE STUDY

This study has used both qualitative and quantitative approaches to explore the perceptions of metacognitive strategy relevance and metacognitive strategy use of students in two disciplines (Agricultural Sciences and Communication Arts) when learning the MSC and English. Multi data collection approaches, including the self reports, the survey questionnaires, the interviews and the think-aloud protocols, were carried out to triangulate the findings.

The metacognitive strategies sought from these approaches were either informed by literature or (as in the case of self reports) actual behaviours provided by the different informants. The initial interviews inquired into informants' understanding of the nature of teaching and learning, their perceptions of the relevance of metacognitive strategies and their actual use of metacognitive strategies in teaching and learning the MSC. Then the questionnaires collected further detail on the perceptions of relevance and use of the 40 predetermined strategies of the four metacognitive processes, i.e., *Planning, Monitoring, Problem-solving* and *Evaluating*, in both the MSC and English. The use of these strategies was also observed while students accomplished a set of listening and reading tasks in the MSC and English through think-aloud protocols. Finally, the self-reports provided informants' actual thoughts and behaviours when listening and reading in the MSC and English.

The findings, in relation to strategies used by successful EFL/ESL learners from the literature, provide an additional list of metacognitive strategies to assist students to learn English as a foreign language independently. This final chapter presents the conclusions of the overall study, discussion of limitations and generalisability, and recommendations for future research.

10.1 CONCLUSIONS & RECOMMENDATIONS

10.1.1 Conclusions from the study

The interviews conducted for this research have provided a broad picture of teaching and learning in Agricultural Sciences and Communication Arts as well as what instructors and students believe, think and do. The self-reports exposed in depth what the informants knew about strategies and how they approached listening and reading tasks across the areas. The interviews, self reports and the think aloud protocols, together, have provided an insight into the interaction between metacognitive processes in learning the MSC and English. The questionnaire data analyses revealed actual proportions of perceived relevance and use in learning and incorporation in teaching and relationships between perceived relevance and use by students and incorporation in teaching by instructors. Results from the self-reports and the think-aloud protocols generally showed the consistency with students' reports on strategy relevance and use. Although the results observed from the Think-aloud protocols were not robust, they clearly triangulate other findings which showed that students used metacognitive strategies in the two tasks in the L1 and FL.

Some of the results, as seen in chapter 4 to 9, are tentative and will need further investigation, although they do support the following conclusions.

The students, unlike when learning the MSC, showed that they were not able to cope with independent learning in English. In learning English both Agricultural Science and Communication Arts students seem to struggle to apply metacognitive strategies, and *Planning* and *Problem-solving strategies* in particular (see also Figure 9.1). These students showed that they had low motivation and low ability to cope with listening or reading in English. They focused on using *Monitoring* (i.e., *comprehension check, detecting weaknesses/obstacles, checking the attention* and *note-taking*) and *Evaluating strategies* (such as *assessing strategy use, judging how much learned, assessing learning/work* and *self-assessment*). In dealing with difficulties, some said they planned to use strategies but did not actually do so. The students who reported using *Problem-solving strategies* were more likely to use the strategies involving affective control or resource management such as suppressing distractions/ inappropriate thoughts, concentration in class, effort directed and/or low level metacognitive strategies such as memorizing words/information or strategies that relied on other agents. Moreover, their self-reports suggest that these strategies did not necessarily help them comprehend what they listened to or read. Students' weaknesses or failures in comprehension discouraged them from putting further effort into learning and from taking responsibility for their own learning.

In learning the MSC on the other hand, both groups of students showed that they had knowledge about metacognitive strategies and frequently used them in learning the MSC. Therefore, they were more able to cope with independent learning tasks when assigned. Communication Arts students were likely to use *Monitoring* and *Evaluating strategies* when learning the MSC. These students perceived the relevance and used a wider variety of metacognitive strategies than their Agricultural Science counterparts, but they struggled to apply these same strategies when learning English. Compared with 23 metacognitive strategies that were frequently used by Communication Arts students for the MSC (4 *Planning*, 6 *Monitoring*, 4 *Problem-solving* and 9 *Evaluating* in the questionnaires) they frequently used only 10 strategies (2 *Planning*, 2 *Monitoring*, 3 *Problem-solving* and 3 *Evaluating* in the questionnaires) for learning English. Agricultural Sciences students recorded relatively few metacognitive strategies that they frequently used for learning the MSC (2 *Monitoring* and 1 *Evaluating* in the questionnaires) and English (2 *Planning*, 1 *Monitoring* and 1 *Problem-solving* in the questionnaires). However, more students in Agricultural Science were consistent in their use of metacognitive strategies for both the MSC and English.

Agricultural Science students were likely to deal with problems in learning the MSC alone (i.e., solving it alone, looking for solutions, trying alternatives were repeatedly mentioned), while Communication Arts students tended towards cooperative strategies, such as seeking peer support, consulting the instructor, discussing the problem, working it out in a group). However, students in Agricultural Sciences were also more likely to use avoidance strategies (*doing nothing*, *ignoring problem*) and to *give up* more easily than the Communication Arts students.

There were some strategies that were clearly more suitable for the MSC than English and vice versa. Students were more likely to use some strategies for the MSC, such as *checking importance of the information, trying alternatives, within subject applicability* and *other area applicability* which suggests a skill deficiency where students have developed more advanced skills for learning the MSC than for English and a higher motivation to learn. However, the fact that they were more likely to use such strategies as *preparing to confront obstacles, preparing for class, consulting a dictionary, keeping a vocabulary list, converting into L1, self-assessment* for English does suggest that the students were eager to put some effort into learning the L2 even though they found it challenging. This might, as Littlewood (1999) argues suggests a need for training in metacognitive strategies to promote autonomy in English learning.

Strategies for independent learning were seen as relevant but not used or vice versa. That is, the students, and particularly in Agricultural Sciences often did not use the strategies they saw as relevant, i.e., *goal setting, linking with prior knowledge, effort directed – Planning*; *seeking related prior knowledge, checking appropriateness of the strategy being used* and *checking linkage to other subjects – Monitoring*; *linking with prior knowledge – Problem-solving*; and *assessing strategy use* and *within subject applicability – Evaluating*.

This might be because of the nature of teaching and learning in this discipline which was reported as lecture focused and with an emphasis on knowledge recognition.

Contrary to this, both groups of students used some strategies but did not report them as relevant (in the self reports or the think-aloud protocols), for example, *seeking related prior knowledge, checking the retrieval of information, checking the attention, checking appropriateness of the strategy being used, checking importance of the information* (*Monitoring*), *ignoring problems*, *doing nothing (Problem-solving)*. In this case, they might have developed the automatic use of these strategies or they might not actually see them as strategies.

There was more evidence of independent learning in Communication Arts than Agricultural Sciences in the MSC than English. As mentioned earlier, relatively few metacognitive strategies were used among Agricultural Sciences than Communication Arts and may be attributable to the fact that more instructive teaching and learning occurred in the Agricultural Sciences. O'Malley and Chamot (1990) emphasise the importance of cultural influence when describing successful learners who come from a rote learning focused education as these learners will have highly developed memory strategies and will be less likely to have developed problem-solving and comprehension strategies. This suggests therefore that students in Agricultural Sciences may need more explicit training in these metacognitive strategies in order to achieve learner autonomy.

There was inconclusive evidence that listening and reading require particular strategies because reading was not often mentioned in either the self reports or the think-aloud protocols. Nonetheless some were evident for either one task or the other, suggesting that different tasks call for particular strategies, for example, the relevance of *note-taking selectively, extra reading, consulting the instructor, concentration in class, reviewing lessons/notes*),or use of *linking with prior knowledge, note-taking selectively, asking for clarification, effort directed, judging how much learned, judging worthiness of learning,* for both listening and reading the MSC and English. This not only confirms previous studies that individual metacognitive strategies such as self-evaluation, self-monitoring (Chamot & Kupper, 1989), selectively note-taking (Chamot & O'Malley, 1987), and using prior knowledge (Walter, 2004) for reading (Chamot & Kupper, 1989; Walter, 2004) and listening in both L1 and L2 (Chamot & O'Malley, 1987; Walter, 2004) but also supports the universality of metacognitive processes to listening and reading tasks and to learning content in L1 and to learning a second/foreign language (Chamot, Barnhardt, El-Dinary, & Robbins, 1999).

This study also shows that lecturers in the two disciplines did not place enough importance on many metacognitive strategies, especially ones which might help poor students in English (e.g., *Planning* and *Problem-solving strategies*). Therefore, many students in both disciplines showed the willingness and had ability to cope with their own learning for the MSC, but they were unable to do this when learning English indicating that more explicit training is needed for both groups.

The requirement of the Thai education plan for independent learning therefore is being partially met. That is, even though most students in both disciplines showed their willingness and ability to cope with learning the MSC independently only some initiative for developing learning autonomy was mentioned. Most students only showed the responsibility to take charge of their own learning when assigned to do so under close guidance. This suggests that lecturers do not explicitly acknowledge or facilitate the development of independent learning.

The lack of strategies used by students to learn English found in this study suggests that the teaching English or other foreign languages in Thailand does not encourage autonomous learning. Lecturers have suprising little understanding of what strategies students do use – which is a serious omission especially for teaching English. Teaching and learning whereby "the teacher is in control, giving explicit directions for every learning activity, and the students passively following those directions" (Robbins, 1996, p. 16) obstructs students from developing the willingness, confidence and skills to learn English independently. Furthermore, Robbins (1996) stresses that opportunities for individuals to learn and explicit training in strategies should be promoted in such a context.

Lecturers in this study implicitly teach some strategies, such as *choosing strategies for the task, checking appropriateness of the strategy being used, (assessing) strategy effectiveness, within subject applicability, other area applicability* which should be taught explicitly. Such strategies are ideal for enhancing learners with a strong motivation to learn. They reinforce the recognition of how to choose appropriate strategies for a learning task. They show students how to overcome obstacles and give them the confidence and ability to cope with study and the motivation to study independently. Moreover, Robbins (1996) claims that, "without time for reflection on the benefits of using learning strategies and evaluation of their effectiveness, students' transfer of strategies to other tasks is unlikely, and the goal of developing a self-regulated learner is in danger of not being achieved" (p. 29).

These findings support the explicit teaching of metacognitive strategies, the creation of autonomous learning environments and improvement in strategy use for Thai students with low level English language skills. This will enhance the required independent learning in English and improved English outcomes mandated in current Thai education policy. Further suggestions are presented in the following relevant sections.

10.1.2 The role of metacognitive strategies in promoting learning EFL independently

The research confirms arguments proposed by Dole & Sinatra (1998), Littlewood (1996; 1999) and previous studies by Robbins (1996), Chamot, Barnhardt, El-Dinary & Robbins (1999), that metacognitive knowledge and experience in using strategies encourage learners' motivation and ability to learn independently. When learning the MSC, the learners used these four processes in an effective way and therefore were willing and had confidence to take charge of their own learning. These positive learning experiences will help them see difficulties, obstacles, weaknesses or failure as challenges which can be overcome by the application of appropriate strategies.

The absence of higher level metacognitive processes lessens a learner's willingness and ability to take charge of his/her English learning (as shown in Figure 9.1) and is, to some extent, in line with the assertion of Koriat and Levy-Sadot (2002). However, unlike their claims about the positive potential of *Monitoring*, this study shows that it is the ineffective use or absence of *Planning* and *Problem-solving* that is the main cause of unsatisfactory performance.

10.2 IMPLICATIONS FOR EFL PRACTICE

10.2.1 Implications for Thai tertiary level curriculum

The finding that many participants appeared to be able to use metacognitive strategies flexibly and effectively in the MSC but not in learning English suggests that students in these two disciplines need to be trained in strategy use. In addition to teaching and practising language and linguistic knowledge and skills, the curriculum at tertiary level should provide strategic knowledge of how, why, where and when to use the four metacognitive strategies investigated in this study and how to recognise opportunities to use them.

It is frequently implied in the literature that metacognitive knowledge and control and regulatory strategies are the keys to learner autonomy. Therefore students from the two disciplines need to use more strategies from the MSC and in their language learning, thus reinforcing their development of independence. This suggests that the current focus on assessing knowledge expertise should be expanded to include the evaluation of strategic expertise.

Another significant finding of this research is that, while MSC lecturers invested effort into providing opportunities to improve knowledge and technical skills, they assumed that the L1 reading ability of their students would develop accordingly. A lack of concern about reading strategies (as evident particularly in the low scores relating to reading in the self reports) was also obvious in both the interviews and think-aloud protocols. Moreover, it appeared that the strategies students used when reading were skills with only low-level metacognitive demand, for example, *re-reading*. This might be a reason why many undergraduates have not met the requirement of the Ninth National Education Plan which states that the reading ability is one of the most important skills for learning independently. Therefore, the incorporation into teaching of high level metacognitive strategies for reading in particular, such as those proven effective by different scholars (e.g., Maki & McGuire, 2002; Otero, 1998; Robbins, 1996; Thompson & Rubin, 1996) should be another curriculum focus.

10.2.2 Implications for classroom practice in Thailand

Although there was significant use of *Monitoring strategies*, i.e., *checking comprehension, self-examination* and *Evaluating strategies* such as *assessing the strategy use, judging how much learned*, the amount of negative information provided by students was discouraging. Many students who described their lack of comprehension, e.g., in self reports and think-aloud tasks, did not appear to use any problem-solving strategies to overcome their difficulties. Some students even openly reported that they *did nothing* or *ignored the problem*. This further supports the urgent need for training in strategies which are at a higher cognitive level for students in both disciplines and possibly for all disciplines of study offered at Thai universities. Proof of the success of explicit strategy training has been provided by for example, O'Malley, Chamot, Stewner-Manzanares, Russo and Kupper (1985), Robbins (1996) and Victori and Lockart (1995). Recently, Robbins (1999) has asserted that:

> Explicit instruction in LLS [languge learning strategies] leads to greater control by the student over the use of LLS and makes it easier to transfer LLS learned for a particular task to another, similar task (p.8 of 14).

Therefore, as suggested by the findings in this research, explicit teaching of metacognitive strategies should be incorporated into the classroom practice of lecturers and particularly of those teaching English as a foreign language.

The study also suggests that some students can develop knowledge about and use of strategies independently of their instructors' advice. This should not be surprising given that previous research have suggested that thinking metacognitively can be taught to students as early as kindergarten (see in Flavell, Miller, & Miller, 1993) which indicates that enhancing students' responsibility and ability to learn English independently should not be challenging at the tertiary level.

For Agricultural Science students who experienced more instructive teaching and learning, opportunities need to be created for them to construct their own knowledge in their English class. Such knowledge is viewed by cognitive construction psychologists as more flexible, transferable, and useful than that transmitted to students by experts, teachers or other delivery agents (Stephens et al., 2000). That is, learning is more effective when learners are actively involved in the learning process, assuming responsibility for their learning, and participating in the decisions which affect it.

Even though Communication Arts students experienced more independent learning in their MSC, there were still many metacognitive strategies not shared in the learning of English suggesting, after Robbins (1999), that learners might need "visible proof of the effectiveness of strategies use" (p. 9). Therefore, the inclusion of knowledge about strategies and greater opportunities to prove its effectiveness is also suggested for this group of students.

10.3 LIMITATIONS, GENERALISIBILITY & FURTHER STUDY

10.3.1 Limitations & Generalisibility

The first limitation inherent in this research derives from the small size of the cohorts. With 10 instructors (5 Agricultural Sciences and 5 Communication Arts) and 74 students (34 Agricultural Sciences and 40 Communication Arts), comparisons of responses in the questionnaires and the self reports allow only tentative conclusions regarding the influence of teaching on students' use of metacognitive strategies.

Second, the participants were at only one university located in a rural area. This relative isolation might affect the informants' attitudes towards learning English and their opportunities of learning independently. Exposure to English outside the university for instance will be more limited than in a capital city such as Bangkok.

Finally, even though the self reports and think-aloud protocols provide information about students' perceptions and use of metacognitive strategies they do not provide robust results. This might have been due to the nature of writing retrospectively or the ability to reflect objectively on strategic knowledge and experiences. Moreover, the sophistication of metacognitive strategies and lack of familiarity with the tasks may have hindered the informants in verbalising their thoughts. In addition, being too cautious in the think-loud protocols lessened the elicitation success of this methodology. For example, in the absence of the researcher, there were no opportunities to prompt the informants to speak their thoughts.

Therefore, generalisation of these findings should be made with caution.

10.3.2 Further study

The findings from this study are not definitive. Some will need further investigation.

The study shows that Communication Arts students, who experienced less instructive learning contexts, used a wider range of metacognitive strategies and used them more frequently than Agricultural Science counterparts. However, while the results do confirm that some individual strategies are common to both learning in the Agricultural Sciences and Communication Arts, this does not prove that these strategies are discipline-specific. Future research into strategy use in other disciplines is therefore needed.

Even though the evidence was not strong, both the questionnaires and the self reports showed markedly different learning strategies for the L1 and L2. Some strategies were reported by a greater number of students when learning in English suggesting that L2 requires the development of new strategies and that could then used in the MSC. Future research therefore could also address the transfer of learning strategies from the learning of English to the MSC.

Even though the evidence did not support definite conclusion different strategies to accomplish listening or reading tasks have been observed in this study. Some strategies, such as *using hints/body language, rehearsing, re-reading, responding in class* are obviously listening or reading specific, while others, i.e., *preparing for class, preparing to confront obstacles* might be affected by language proficiency. Further study of these task-specific strategies is needed.

Finally, this study has focussed on the knowledge and use of metacognitive strategies by Thai students with low proficiency in English. This area of study would be further enhanced by a similar study of high proficiency students.

10.4 CONCLUSION

In conclusion this thesis has highlighted both how little we know about the strategies that students use across disciplines and across tasks and how difficult ascertaining the use of metacognitive strategies can be. The thesis has also clearly demonstrated that learning both in the MSC and in language learning needs considerable further investigation. Despite this, the study has enabled us to make some clear recommendations to assist Thai tertiary students in non-English majors to take charge of their own learning of English.

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APPENDICES

Appendix 3.1: Letter of Seeking Permission

A Letter of Seeking Permission

Edith Cowan University
27 December 2000
Asst. Prof. Somchai Wongasem, President
Rajabhat Institute Ubon Ratchathani
Ubon Ratchathani, 34000 Thailand

Dear President,

Subject: Seeking permission to conduct a research project

Further to my university approved research project entitled “The role of metacognitive strategies in promoting learning of English as a foreign language”, I would like to ask for your permission to carry out research in Rajabhat Institute Ubon Ratchathani (RIUbon). This study aims to achieve understanding about what learning strategies learners use in learning the subject matter content in their respective disciplines. This information will lead to the compilation of a list of learning strategies that suit the needs of each group of disciplines in order to help those students to learn English independently. The second year students enrolling in and instructors working for two different faculties, namely Agricultural Sciences and Management Sciences in the academic year 2001, have been selected to be subject of this study.

Your approval and support would be highly appreciated.

Sincerely yours,

Chayada Danuwong (Ms)

Enclosures (2): 1. Ethics clearance
2. Research proposal

Appendix 3.2: Names of the Experts and Lecturers

Content And Face Validity Considerated By

Dr. Seri Somchob: English

Asist. Prof. Noppadol Jundharapen: Thai & Public Relations

Dr. Supunnee Oaki: Agricultural Science –Biology

Difficultties And Suitability Of The Content And The Tasks

Dr. Seri Somchob: English

Dr. Supunnee Oaki: Agicultural Science – Biology

Ms. Worraluck Duangsri: Communication Arts – Public Relations

Lecturers

Ms. Worraluck Duangsri: Communication Arts

Dr. Supunnee Oaki: Agricultural Science

Ms. Sonya Taylor: English

Relevance of Translation

Dr. Seri Somchob: Expert

Prof. Ian Malcolm: Supervisor

Appendix 3.3: The interview guides for instructors

Directions: You are requested to respond to the questions concerning the nature of learning in your discipline and how to learn effectively.

Open-ended Questions

1. Which discipline do you teach? What do you find the most helpful way to learn in this discipline?
2. How do your students learn, e.g., attending lectures, workshops, laboratories?
3. How well are they doing?
4. Do you think they could go better in this discipline? How?
5. What do you expect your students to do to be good students in this discipline?
6. What do you do to encourage your students to learn effectively in this discipline?
7. What are the main things students in this discipline have to learn?

Guided Questions

Do you think the following strategies are useful for your students to learn by themselves? How?

1. reviewing specific concepts before proceeding a task;
2. developing effective skills, such as managing resources, making connections, refining;
3. working problems, for example choosing suitable solutions from alternatives;
4. maintaining/monitoring progress/benefit?
5. Any other strategies?
6. How do you evaluate your students?
7. Do you evaluate the strategies in No. 1-5? If so how?

Appendix 3.4: The interview guides for students

Directions: You are requested to respond to the questions concerning the nature of learning in your discipline and how to learn effectively.

Open-ended Questions

1. In which discipline are you enrolling? What do you find the most helpful way to learn in this discipline?
2. How do you learn, e.g., attending lectures, workshops, laboratories?
3. How well are you going in this discipline?
4. Do you think you could go better in this discipline? How?
5. What do the lecturers expect you to do to be good students in this discipline?
6. What do you do to effectively learn in this discipline?
7. What are the main things you learn in this discipline?

Guided Questions

Do you think the following strategies are useful to learn by yourself? How?

1. reviewing specific concepts before proceeding a task;
2. developing effective skills, such as managing resources, making connections, refining;
3. working problems, for example choosing suitable solutions from alternatives;
4. maintaining/monitoring progress/benefit?
5. Any other strategies?
6. How do your lecturers evaluate your learning?
7. Do you evaluate the strategies mentioned in no. 1-5? If so how?

Appendix 3.5: Selected metacognitive strategies and their actual practice in learning the MSC & English

Planning Strategies	Source	Actual Practice in the MSC	Actual Practice in English
1. Goal setting	Chamot et al (1999)	Deciding objectives of listening/reading and keeping them in mind.	Deciding objectives of listening/reading and keeping them in mind.
2. Directing attention selectively	Chamot et al (1999)	Choosing to focus on particular information/parts.	Choosing to focus on specific aspects of language/text.
3. Linking with prior knowledge	Chamot et al (1999); Huitt (1997)	Deciding what is already known about the subject, topic, or issue that will be helpful.	Deciding what is already known about the world, linguistic features relating to the topic that will be helpful.
4. Expecting the encountered problems	Kujawa & Huske (1995)	Thinking of problems, such as language, information that expected to encounter.	Thinking of problems, such as sound, intonation, speed, words, grammar and information that expected to encounter.
5. Intending to ignore distractions	Chamot et al (1999); Halt (2000)	Deciding to ignore physical, mental and environmental distractions.	Deciding to ignore physical, mental and environmental distractions.
6. Preparing to confront obstacles	Kujawa & Huske (1995)	Checking in advance personal comprehension of the instruction, lecture and materials. Asking for further information if neccessary.	Checking in advance personal comprehension of the instruction, lecture and materials. Asking for further information if neccessary.
7. Predicting outcomes/ answers	Chamot et al (1999); Mitchell (1995)	Making predictions what to get out of listening/reading or answers of the questions.	Making predictions what to get out of listening/reading or answers of the questions.
8. Predicting the incoming information	Huitt (1997)	Anticipating what information or event will occur first and next.	Anticipating what information or event will occur first and next.
9. Choosing strategies for the task	Huitt (1997); Mitchell (1995)	Selecting activities or behaviours that help to learn.	Selecting activities or behaviours that help to learn.
10. Work ordering	Kujawa & Huske (1995)	Sequencing what to do first and next to accomplish the task.	Sequencing what to do first and next to accomplish the task.

Continues over

Appendix 3.5 – Continued

Monitoring Strategies	Source	Actual Practice in the MSC	Actual Practice in English
Comprehension .1 check	Chamot et al (1999); Huitt (1997)	Checking periodically whether the material is making sense.	Checking periodically whether the material is making sense.
Checking .2 progress	Huitt (1997); Mitchell (1995)	Checking how well/ whether appropriate rate one is doing.	Checking how well/ whether appropriate rate one is doing.
Detecting .3 /weaknesses obstacles	Huitt (1997); Mitchell (1995)	Checking whether one is on the right track and any weaknesses/obstacles.	Checking whether one is on the right track and any weaknesses/obstacles.
Seeking related .4 knowledge prior	Huitt (1997)	Searching known knowledge about the world, theories and technical skills that relate to current information/ event.	Searching known knowledge about phonology & phonological segmentations, words, grammar & syntax, the world and strategies that relate to current information/event.
Checking the .5 retrieval of required information	Huitt (1997)	Making confirmation that one gets the information one needs.	Making confirmation that one gets the information one needs.
Checking the .6 ionattent	Halter (2000)	Checking whether you direct your attention to learning.	Checking whether you direct your attention to learning.
7. Checking appropriateness of the strategy being used	Kujawa & Huske (1995)	Asking if the strategy being used is suitable.	Asking if the strategy being used is suitable.
8. Checking importance of the information	Kujawa & Huske (1995)	Asking which information is important and needs to be remembered.	Asking which information is important and needs to be remembered.
9. Checking the linkage to other subjects	Mitchell (1995)	Seeking if any on-gong information relates to other subjects.	Seeking if any on-gong information relates to other subjects.
10.Checking correctness of the predictions/ answers	Chamot et al (1999)	Using the information retrieved to confirm that the predictions/answers are correct	Using the information retrieved to confirm that the predictions/answers are correct

Continues over

Appendix 3.5 – Continued

Problem-solving Strategies	Source	Actual Practice in the MSC	Actual Practice in English
Revising the .1 plan	Huitt (1997)	Revising the plan if it is not working to expectations/ satisfaction.	Revising the plan if it is not working to expectations/ satisfaction.
Accessing .2 various resources	Chamot et al (1999); Huitt (1997)	Using various kinds of resources, e.g., graphs, charts, key concepts, outline and/or other reference materials such as those in libraries, computer programmes/databases and the Internet.	Using various kinds of resources, e.g., graphs, charts, key concepts, outline and/or other reference materials such as dictionaries, textbooks, glossary, the CD ROMs, computer programmes/ databases, and the Internet
Ignoring .3 problems	(A reviewer's comment)	Ignoring problems	Ignoring problems
orAsking f .4 clarification	Chamot et al (1999)	Making that the content is understood clearly by asking for explanation, confirmation or examples	Making that the content is understood clearly by asking for explanation, confirmation or examples
Linking with .5 prior knowledge	Chamot et al (1999)	Trying to overcome comprehension problems by linking what hear, read and see to what have known or have learnt.	Trying to overcome comprehension problems by linking what hear, read and see to what have known or have learnt.
Seeking peer .6 support	Chamot et al (1999); Huitt (1997)	Seeking help from peers.	Seeking help from peers.
Trying .7 alternatives	Chamot et al (1999)	Using different ways to overcome an obstacle	Using different ways to overcome an obstacle
)Making .8 guesses (wne	Chamot et al (1999)	Making (new) guesses based on what I know about world, subject, topic, issue and language (when the previous one is not correct).	Guessing meanings of unfamiliar words/ideas or guessing the meaning of the connected speeches based on what I know ((when the previous one is not correct).
Logic .9 reasoning	Chamot et al (1999); Huitt (1997)	Using background knowledge and experiences and earlier information to learn, e.g., considering consequence of the problem/information/ event.	Using background knowledge and experiences and earlier information to learn, e.g., considering consequence of the problem/information/ event.
encour-Self .10-agement	Chamot et al (1999)	Telling oneself to keep trying or put more effort until the problem is solved/the task is accomplished.	Telling oneself to keep trying or put more effort until the problem is solved/the task is accomplished.

Continues over

Appendix 3.5 – Continued

Evaluating Strategies	Source	Actual Practice in the MSC	Actual Practice in English
Judging that the .1 goal has been met	Chamot et al (1999)	Deciding that the goal has been met.	Deciding that the goal has been met.
Assessing .2 strategy use	Chamot et al (1999)	Judging how the strategy has been used and/or how the strategy works.	Judging how the strategy has been used and/or how the strategy works.
Within subject .3 applicability	Mitchell (1995); Huitt (1997); Kujawa & Huske (1995)	Considering how to use/using learning in other contexts within a subject area.	Considering how to use/ using learning in other contexts within a subject area.
Other area .4 applicability	Huitt (1997); Mitchell (1995)	Considering whether/how the strategies/knowledge can be applied to similar situations in other areas.	Considering whether/how the strategies/knowledge can be applied to similar situations in other areas.
Seeking other .5 suitable strategy	Huitt (1997); Kujawa & Huske (1995); Mitchell (1995)	Thinking about other strategies that may help in this circumstance.	Thinking about other strategies that may help in this circumstance.
Summarizing .6 ideas/lessons	Chamot et al (1999)	Making a mental, oral or written summary of ideas/lessons.	Making a mental, oral or written summary of ideas/lessons.
Judging how .7 much learned	Huitt (1997); Kujawa & Huske (1995)	Judging how much you learned from the lectures/reading	Judging how much you understood what you listen/read
Assessing .8 correctness of the predictions/ answers	Chamot et al (1999)	Judging whether the predictions/ answers are correct.	Judging whether the predictions/ answers are correct.
Comparing new .9 knowledge with known knowledge	Huitt (1997); Kujawa & Huske (1995)	Deciding the newly acquired information supports/ contradicts that already known.	Deciding the newly acquired information supports/ contradicts that already known.
Judging .10 worthiness of learning	(from the interviews at the pilot study phase)	Judging whether learning is useful for future use/trustworthy.	Judging whether learning is useful for future use/trustworthy.

Appendix 3.6: Questionnaires on Learning Strategy Training

Instructions: Please respond to the statements concerning metacognitive strategies training below by indicating how important you think it is and how you operate them in your class. There is neither right nor wrong answer. It is important that you do it as honestly as you can. React to each statement by crossing (**X**) one of the following choices under each scale.

Scale A: Level of discerning its relevant to learning.

Strongly agree 5 Agree 4 Rather agree 3 Disagree 2 Strongly disagree 1

Scale B: Method of giving training it to students.

Always do it directly **5** Often do it directly **4** Sometimes do it directly **3**
Sometimes do it indirectly **2** Never do it at all **1**

Example 1:

If you think that "setting my own learning objectives and keep them in my mind" is extremely important to learning major subject content put **X** in the box labeled **5** under scale A. **Discern Its Relevant to Learning**. And you regularly train it directly-make students clear about how, why and when to employ it- put **X** in the box labeled **4** under scale B. **Method of Teaching**.

Planning Strategies	A. Discern Its Relevant to Learning					B. Method of Teaching				
	5	4	3	2	1	5	4	3	2	1
1. Setting my own objectives and keeping them in my mind.	x						x			

Example 2:

If you think that "identifying in advance the aspects of information to look for…"in learning major subject content is definitely unimportant. Put **X** in the box labeled **1** under scale A. **Discern Its Relevant To Learning**. However, you sometimes guide your students to do it without explaining its advantages and when to use it put **X** in the box labeled **2** under scale B. **Method of Teaching**.

Planning Strategies	A. Discern Its Relevant to Learning					B. Method of Teaching				
	5	4	3	2	1	5	4	3	2	1
1. Identifying in advance the aspects of information to look for and focusing on that particular information.					x				x	

Planning Strategies	A. Discern Its Relevant to Learning					B. Method of Teaching				
	5	4	3	2	1	5	4	3	2	1
1. Setting my own objectives and keeping them in my mind.										
2. Identifying in advance the aspects of information to look for, and focusing on that particular information.										
3. Deciding what is already known about the subject, topic, or issue that will be helpful.										
4. Identifying problems that might be encountered in the tasks.										
5. Deciding in advance to ignore mental, physical and environmental distractions.										
6. Checking in advance personal comprehension of the instruction, lecture and materials. Asking for further information if neccessary.										
7. Making predictions what to get out of listening/reading or answers of the questions.										
8. Anticipating what information or event will occur next.										
9. Thinking in advance about strategies and tactics that I can use to understand the subject, topic or issue.										
10. Trying to find out what can be done in sequence to make lectures or texts understandable.										
11. Other strategies										

Continues over

Appendix 3.6 -- Continued

Monitoring Strategies	**A. Discern Its Relevant to Learning**					**B. Method of Teaching**				
	5	**4**	**3**	**2**	**1**	**5**	**4**	**3**	**2**	**1**
12. Checking periodically whether the material is making sense.										
13. Asking myself how well I am doing and whether I am working at an appropriate rate.										
14. Asking myself whether I am on the right track and any weaknesses have shown up.										
15. Comparing what I am hearing, reading and seeing with what I know.										
16. Asking myself whether I know what I need to know.										
17. Asking myself whether what is paid attention to is important for the subject, topic or issue.										
18. Asking myself whether the appropriate techniques are being used.										
19. Asking myself what important information should be remembered.										
20. Seeking if any on-gong information relates to other subjects.										
21. Using the information gain to decide whether the predictions or answers are correct.										
22. Other strategies										

Continues over

Appendix 3.6 -- Continued

Problem-solving Strategies	A. Discern Its Relevant to Learning					B. Method of Teaching				
	5	4	3	2	1	5	4	3	2	1
23. Revising my plan if it is not working to my expectations/satisfaction.										
24. Using various kinds of resources to make my understanding clear, e.g., graphs, charts, key concepts, reference materials and/or outline.										
25. Ignoring the problems.										
26. Making that the content is understood clearly by asking for explanation, confirmation or examples										
27. Trying to overcome comprehension problems by linking what I hear, read and see to what I know or have learnt.										
28. Seeking help from peers.										
29. Trying different alternatives to solve a problem/find out the solution.										
30. Making new guesses based on what I know about world, subject, topic, issue and language when the previous one is not correct.										
31. Using background knowledge and experiences and earlier information to learn, e.g., considering consequence of the problem/information/ event.										
32. Encouraging myself to keep on trying until the suitable way(s) to solve a problem can be found or the task is accomplished.										
33. Other strategies										

Continues over

Appendix 3.6 -- Continued

Evaluating Strategies	**A. Discern Its Relevant To Learning**					**B. Method of Teaching**				
	5	**4**	**3**	**2**	**1**	**5**	**4**	**3**	**2**	**1**
34. Judging whether my goals were met.										
35. Deciding whether/how the strategies used are suitable and helpful for achieving the objectives.										
36. Considering whether/how the strategies/knowledge can be applicable to other situations in the same subject.										
37. Considering whether/how the knowledge/strategies can be applied to similar situations in other areas.										
38. Thinking about other strategies that may help in this circumstance.										
39. Making a mental, oral or written summary of ideas/lessons.										
40. Judging how much I learnt.										
41. Judging whether the predictions/ answers are correct.										
42. Deciding the newly acquired information supports/ contradicts that already known.										
43. Judging whether the newly acquired information is worth learning/useful for future learning/trustworthy.										
44. Other strategies										

Personal Information

Name______________________________________ Field of Teaching____________________
Sex__Female____Male Age _____________ No. of Year of Teaching________________
Apart from teaching I am in charge of ____

THANK YOU

Appendix 3.7: A Questionnaire on Learning Strategies Used by Students

Instructions: In this questionnaire you are asked to respond to statements concerning subject matter content, practices and behaviors by indicating how regularly you engage in each of them. There is no right way of studying. It is important that you answer each question as honestly as you can. If you think that your answer to a question would depend on the subject being studied, give the answer that would apply to the subject(s) most important to you. Cross (**X**) one of the following choices under each scale.

Scale A. Discerning the importance of the strategy in

a). listening to lectures or reading materials related to subject(s) in the discipline, and

b). listening to or reading EFL materials.

Strongly agree **5,** Agree **4,** Rather agree **3,** Disagree **2,** Strongly disagree **1.**

Scale B. Using it in learning

a). major subject content and

b). English.

Always use it **5,** Often use it **4,** Sometimes use it **3,** Rarely use it **2,** Never use it **1.**

Example 1:

If you agree that setting your own learning objectives and keep them in your mind is important to learning major subject content and English put **X** in boxes labeled **4** under scale “A. Discern its relevant to **Major Subject Content** and **English.**” If you quite regularly set objectives by yourself in learning major subject content but never set any in learning English put **X** in the box labeled **4** under scale “B. Use in learning Major Subject Content” and in the box labeled **1** under scale “B.Use in learning **English.**”

planning Strategies	**A. Discern its relevant to**										**B. Use in learning**									
	Major Subject Content					English					Major Subject Content					English				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1. I set my own learning objectives and keep them in my mind before a listening/ reading task.		x					x					x								

Example 2:

If you disagree with the importance of identifying the aspects of information to look for… on learning major subject content put **X** in the box labeled **2** under scale A. “Discerning its relevant to **Major Subject Content**.” However, you definitely agree that doing so is important in learning English put **X** in the box labeled **5** under scale A. “Discerning its relevant to **English**.” You sometimes do it in learning major subject content put **X** in the box labeled **3** under “B. Use in learning to **Major Subject Content**.” You always do it in learning English then put **X** in the box labeled **5** under “B. Use in learning **English**.”

planning Strategies	**A. Discern its relevant to**										**B. Use in learning**									
	Major Subject Content					English					Major Subject Content					English				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
2. I identify in advance the aspects of information to look for, and I will focus on that particular information before a listening/reading task.				x		x							x			x				

Planning Strategies	A. Discern its relevant to										B. Use in learning									
	Major Subject Content					English					Major Subject Content					English				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1. I set my own learning objectives and keep them in my mind before a listening/ reading task.																				
2. I identify in advance the aspects of information to look for, and I will focus on that particular information before a listening/reading task.																				
3. I decide what I already know about the subject, topic, or issue that will help me before a listening/reading task.																				
4. I identify problems that might be encountered in the tasks before a listening/reading task.																				
5. I decide in advance to ignore mental, physical and environmental distractions before a listening/reading task.																				
6. Checking in advance personal comprehension of the instruction, lecture and materials. Asking for further information if neccessary.																				
7. I try to predict the outcomes/answers before a listening/ reading task.																				
8. I think in advance about the structure of the incoming information before a listening/ reading task.																				
9. I think in advance about strategies and tactics that I can use to learn the subject, topic or issue before a listening/reading task.																				
10. I try to find out what I will do in sequence to understand the lectures or the texts before a listening/reading task.																				
11. Other strategies																				

Continues over

Appendix 3.7 -- Continued

Monitoring	A. Discern its relevant to										B. Use in learning									
	Major Subject Content					English					Major Subject Content					English				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
12. While listening/reading, I periodically check whether the material is making sense to me.																				
13. While listening/reading, I ask myself how well I am doing and whether I am learning at an appropriate rate.																				
14. While listening/reading, I ask myself whether I am on the right track and whether any weaknesses have shown up.																				
15. While listening/reading, I decide if any of what I am hearing, reading and seeing relate to what I have known.																				
16. While listening/reading, I ask myself whether I know what I need to know.																				
17. While listening/reading, I ask myself whether what I am paying attention to is important for learning the subject, topic or issue.																				
18. While listening/reading, I ask myself whether I am using the appropriate techniques.																				
19. While listening/reading, I ask myself what important information I should remember.																				
20. While listening/reading, I ask myself whether the on-going information links with other subjects.																				
21. While listening/reading, I ask myself whether my prediction and guesses are correct.																				
22. Other strategies																				

Continues over

Appendix 3.7 -- Continued

Problem-solving	**A. Discern its relevant to**										**B. Use in learning**									
	Major Subject Content					**English**					**Major Subject Content**					**English**				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
23. When I face with a difficulty in listening/reading task I revise my plan if it is not working to my expectations/satisfaction.																				
24. When I face with a difficulty in listening/reading task I use various kinds of resources to make my understanding clear, e.g., graphs, charts, key concepts outline, and/or reference materials such as dictionaries, textbooks, handouts, glossary, computer programmes or databases, the CD ROMs, the Internet.																				
25. When I face with a difficulty in listening/reading task I ignore the problem.																				
26. When I face with a difficulty in listening/reading task I make sure that what my understanding is correct.																				
27. When I face with a difficulty in listening/reading task I try to overcome problems by linking what I hear, read and see to what I know or have learnt.																				
28. When I face with a difficulty in listening/reading task I seek help from peers.																				
29. When I face with a difficulty in listening/reading task I try different alternatives to solve a problem.																				
30. When I face with a difficulty in listening/reading task I make new guesses when the previous one is not correct based on what I know about the world, subject, topic, issue and language.																				
31. When I face with a difficulty in listening/reading task I use background knowledge and experiences and earlier information to learn.																				
32. When I face with a difficulty in listening/reading task I encourage myself to keep on trying until I can find suitable way(s) to solve a problem.																				
33. Other strategies																				

Continues over

Appendix 3.7 -- Continued

Evaluating Strategies	**A. Discern its relevant to**										**B. Use in learning**									
	Major Subject Content					**English**					**Major Subject Content**					**English**				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
34. After completing a listening/reading task I judge whether my goals were met.																				
35. After completing a listening/reading task I decide whether the strategies I use are suitable and how it helps me achieve the objectives.																				
36. After completing a listening/reading task I consider whether/how the used strategies can be applicable to other situations in the same subject.																				
37. After completing a listening/reading task I consider whether/how these strategies can be applied to the similar situations in other areas.																				
38. After completing a listening/reading task I think about other strategies that may help in this circumstance.																				
39. After completing a listening/reading task, I mentally, orally or graphically summarize what I have learnt.																				
40. I judge how much I have learnt.																				
41. I judge whether my guesses and predictions are correct.																				
42. After completing a listening/reading task I decide if the newly acquired information contradicts/supports what I already know.																				
43. After completing a listening/reading task I judge whether the newly acquired information is useful for future learning/ trustworthy.																				
44. Other strategies																				

Personal Information

Name_______________________________________ Area of Study: ___Arts___ Science

Age_________________________ No. of Year Studying English__________ Sex: ___ F___ M

No. of Year in English Speaking Country_______

How well do you think you are in learning your discipline?

___excellent___good___fair ___poor ___very poor

How well do you think you are in learning English?

___excellent___good___fair ___poor ___very poor

Thank you

Appendix 3.8: Tasks for Communication Arts Students

Task A1 Listening to a lecture

Instructions: You are to listen to a 15-minute lecture on broadcasting. After listening choose a type of programme in which you are interested, specify the target group(s) and write a script for 1-minute broadcast. You have 25 minutes to do this task. While doing these activities please speak out loud what you think, how you are doing the activity and whether that is helpful or successful.

SCRIPT

Broadcasting: Talk Programmes & Broadcast News

Compiled by Woraluk Duangsri
Rajabhat Institute Ubonratchathani

Broadcasting Categories

Broadcasting is divided in accordance with its objectives. For example, BBC radio station, relative to characteristics of the transmission, classifies it into 6 categories as follows.

News and Current Affairs
The Discussion Programme
The Phone-in Programme
Record Programme
The Magazine Programme
The Documentary Feature Programme
In general, broadcasting is grouped into 8 different categories.
Song Programme which has two sub-categories. They are
Sole Song, and Song & Talk.
Talk Programme which includes 7 subcategories.
The Journal, The Announcement, and/or The Sermon.
The Interview.
The Group Discussion.
The Round-Table Discussion.
The Conversation.
The Question-Answer (Q-A) / Answer an audience's problem(s).
The Debate.

Talk Programmes

Talk programme aims at entertaining the listeners through the sole talking that might be the straight talk or the indirectly talk with a listener. It consists of 4 sub categories.

The Straight Talk
The Interview
The Conversation
Pannel Discussion

The Straight Talk

The Straight Talk is the most directly talking between an operator and a listener. It helps save time and money. The topic can be flexible. Genre, tone, and style are a programme operator's characteristics. Two different kinds of topic are used.

Speakable Talk. A topic usually involves the speaker's experience of an impression, an intimidation, or an excitation, etc. The talk focuses on a point at a time.

Unspeakable Talk. It is about what is unheard or unknown to the speaker. Yet it is necessary to be mentioned. Only the truth is presented. Comparison those events to the present one is used to give the audiences an insight.

Technique in operating the Straight Talk starts with a few provocative sentences.

Then direct to the point. The information contain the answers to who, what, where, why, and how. At the end, instigation should be used.

Simple words are suggested. Comparing and giving examples until the audiences can see the picture of the consequence in their mind. The content must suit to the time limit. In general, a short-cut programme that are transmitted between two long programmes takes no longer than 1 minute. If it takes longer, say 3-5 minutes, the additional is talking about its background. Such programme is called "Feature Talk."

Moreover, there are some programmes that are similar to the talk programme. They are another types, namely Commentary and News Commentary. Operating these programmes, an operator must study hard and rearrange the information to attract the audiences as well as to fit the time limited, 10 minutes approximately. Only a reporter manipulates a commentary by decribing or critizing an issue without any tape recorder or sound track. Mostly, it leads to an argue against that consequence. Sometimes, it induces an attitude involving the topic presented which may either be for or against. Considering its characteristics, it is not different from talk programme.

Example of the Straight Talk

Time: 1 minute

Speakable Talk

Issue: Roses are Incomparable True Love

Roses are known as flowers of love, isn't it? One day, my lovely girlfriend's birthday, I bought some roses from Samyan Market intended to express my fondness. I had expected her at the university from down till dust, however, she did not show up. My roses started to lose its freshness. I decided to go to her home and found that she was ill. She greeted me at her door and accepted the dried roses. She threw them in a bin though, I felt as if my heart had stopped. Yet, she said "your tenderness was more important than those roses. I loved you so much." God! I was very delighted. If one has true love nothing can represents it. Do you agree? So as to the love of our country, we don't let anything else to be in place of her, do we?

Unspeakable Talk

Topic: Dinosaurs Were Extinct Because Of Their Tongues

Original

Dinosaurs ruled the world and subsisted for over 80 million years as they were so huge and so strong that no animals could confront them.

A theory revealed that the extinction of dinosaurs was because they were victims of their own eating habits. Tony Swain of English National Plants believed that we could trace to the dinosaurs' vanishing from the giant turtles living at present. They both were reptiles. Their capabilities in tasting were similar, that is to say they tasted Morphine or Quinine 40 times slower than Mammals did.

The last scene of dinosaurs began when there were trees and flowers in place of ferns and moss that had been their food for many years. Later on, some flowers turned bitter and poisonous and mammals and insects avoided eating them. Since dinosaurs' tongues could not work well they did not know those were toxic. So they ate them.

The experimentation with the giant turtles indicated the same result. They did not realize what was destructive. Some types of dinosaurs ate another dinosaurs' meat. Those meat were poisonous and they were gone accordingly. Scientists added that a reason why they did not exist was they laid too fragile eggs. Hence, their children were not healthy enough to live.

How To Write A Minute Straight Talk

Issue: Dinosaurs Were Extinct Because Of Their Tongues

Do you know dinosaurs? I daresay the ones who like seeing a million world movies must familiar with them. Do you know why they were extinct? Some might said they had starved to death because they were huge. However, a British scientist recently revealed that they vanished because of their tongues. They ate everything since their tongues couldn't work well. They used to eat fern before there were flowers and trees. Some of them were fatal and caused dinosaurs to die. Likewise, eating without considering can brings death to us, human beings.

Note: In writing the unspeakable talk, a scientist's name or object that is difficult to recognize can be ignored. Directing to the point is important. Avoid doing exaggerate or supplying too details because this talk takes only 1 minute.

Broadcast News

Broadcast news concerns events or stories have just happened and grabbed the listeners' attention. The news should respond to the listeners' curiosity and report the being-interesting circumstances within the country or in other countries. Make sure the information is accurate and new.

Besides, broadcast news is rapid and can be reported 24 hours. The news is directly transmitted to public with the most important facts and its headline. Reporting it again and again can be done.

Possible newsworthy story for broadcasting includes:

1. Accidents and Conflict;
2. Gatherings such as meeting, seminar;
3. Sports;
4. New Project;
5. Government Action;
6. Nature, for example, flood, drought, environment changes; and
7. People, that is, the VIP's visiting, murder, touch- the- emotion story or else that cause people laugh and cry.

Rules in Considering Its Importance or Interesting

1. Timeliness
2. Nearmen or Proximity
3. Consequence and Significance
4. Importance or Prominence
5. Human Interest

Types of Broadcast News

According to the content and how to present it, there are 3 types.

1. Straight news. Exactly what has happened is reported, for example, daily news that includes local, foreign and sports news.
2. News Commentary. Apart from informing, idea is added.
3. News Analysis. It presents the news' background rather than just informs the fact. It aims at educating the listeners. Mostly is about the significant news such as political news, education news.

Besides, broadcast news can be divided relative to how to report it.

1. News bulletin. The programme reports different types of news continually. It sometimes starts with local news, sports and encloses with news appealed to people. It takes 30-60 minutes.
2. News Reel. A reporter describes an event reeling with brief interview and/or occasionally with comments.
3. News Integrated. A programme consists of news bulletin, news reel and news critic. Time is equally allocated for each kind. In 30-minute news integrated, for example, each of the threes mentioned takes 10 minutes.

Source of News

1. News Agencies such as AP, UPI, Reuter, Thai bureau.
2. Networks, e.g., radio stations located in various provinces.
3. Local News Sources.
4. Newspapers
5. Other Radio Stations.
6. Buroaus
7. Non-Profitable Organizations, Enterprises Organizations, Relegious Organizations, Social Organizations, Educational Organizations, etc.
8. Private volunteers.

Writing Broadcast News Strategy

Broadcast news must be simple, precise, uncomplicated, appealing, and lively. Essential rules for writing this type of news covers the followings.

1. Accuracy
2. Simplicity
3. Brevity
4. Directness
5. Color
6. Objectivity
7. Fairness
8. Good Taste

Unlike the newspapers that use reverse pyramid technique, broadcast news are likely to lead the listeners to the target bit by bit. The climax is at the last part because the listeners' attention is grabbed throughout.

In broadcast news, the news agency and the location where it took place are reported at a start. The newspapers present Lead and Body in different paragraph, on the contrary, they are not clearly distinguished in broadcast news. Both lead and body are regularly written in a single paragraph. For example:

"At the Commander Building of the Government, around 10 a.m. today, General Police Officer Pao Sarasin, the Secretary-General of the Board of Drug Prevention & Suppression, led

Mr. T.B. Weerawitthaya, the minister of Srilang-ga Ministry of Defense and the chairman of the Srilanga 's Committee for Drug Consulting, to pay compliments to General Officer Serm Na Nakorn, vice-prime minister and the chairman of the Board of Drug Prevention & Suppression, during his visiting Thailand and her working against drug between the 28th of this month to the 1st of next month. On this occasion, they exchanged the idea on drugs which is the worst international problem to figure out the strategy for preventing and suppressing drugs in both Thailand and Srilang-ga. …."

To apply this news for the newspaper, it needs more details. Moreover, Lead and Body must be discriminated by presenting in different paragraph.

> "At the Commander Building of the Government, around 10 a.m. today (31 October), General Police Officer Pao Sarasin, the Secretary-General of the Board of Drug Prevention & Suppression, led Mr. T.B. Weerawitthaya, the minister of Srilang-ga Ministry of Defense and the chairman of the Srilanga 's Committee for Drug Consulting, to pay compliments to General Officer Serm Na Nakorn, vice-prime minister and the chairman of the Board of Drug Prevention & Suppression, during his visiting Thailand.
>
> Mr. T.B. Weerawitthaya was visiting Thailand between 28th October-1st November in order to studying the working against drugs in Thailand. On his paying respect to General Officer Serm Na Nakorn today, they exchanged the idea on drugs, which is the worst international problem. The solutions would be used as the policy in preventing and suppressing drugs in both Thailand and Sri lang-ga."

Some Suggestions in Writing Broadcast News

1. Since the listeners cannot request for re-reading when they do not catch it up, news writer should keep in mind that newspaper is for reading but broadcast news is for listening.
2. Keep the news short and punchy. A sentence is for one point of view. If a sentence expresses many functions it surely confuses the listeners.

The followings are examples of either unsuitable or suitable transmitted news.

> "As the cost of fuel, living and materials are extremely higher the government which runs by General Officer Chatichai Chunhawon, the prime minister, granted Water Supply Division and Electricity Division to raise the fees from the 1st November." (unsuitable)

The above news writes a paragraph with only one long sentence or a complex sentence. Such a long sentence suits in presenting on a newspaper but broadcast. Writing broadcast news should split it into more short sentences as below.

> " The rate of water supply and electricity fee is to be higher from the 1st November. The government granted Water Supply Division and Electricity Division to raise the fees. The government reasoned that the circumstance had been differed. That is to say, the cost of fuel had been up so as to other cost of living and raw materials. They granted them to adjust the price of water supply as well as the electricity." (more suitable)

3. Avoid using the repetitive words or the words that sound similarly. Because it is difficult to read and hard to understand.
4. Strictly follow no. 2 may result in using for-kindergartner language and boring the listeners stiff. Better keep the flexibility in mind. The length of sentences can be short or long. For example, the first two sentences are short the next one should be long or a complex sentence help smooth the news.

5. Reporting words in quotation, reporters should mention who had said. At present where news- reel is more popular, reporters should conclude after transmitting the long reel that who has said, been interviewed, or given the speech. (Indicate the speaker's name, ……… to the PR at ……)
6. The be-in-news people 's identification helps make the listeners understand the news easier and familiar with those VIP such as the prime minister, the president, or the world VIP. Some importances may be recognized only by their identities. However, many people need to be identified. For broadcast news, names are reported preceding their positions such as Mr. Tuksin Chinnawatrara, the prime minister.
7. Using too short expressions might confuse the listeners. For example.

" Police Lieutenant Suriyon Riwa, General Secretary of the minister of Ministry of Finance, was dead yesterday."

The listeners who might be stay very late at work or pay half attention may misunderstand that the minister of Ministry of Finance is dead. To prevent such mistake, this news need more sentences.

"Police Lieutenant Suriyon Riwa was dead yesterday. Before passing away Police Lieutenant Suriyon Riwa was the General Secretary of the minister of Ministry of Finance.

8. Keep digits easy to read. For instance.

8,765,000 baht should be written " 8 million 7 hundred 65 thousands" or "eight million seven hundred sixty-five thousands."

According to time, there is no different in writing but reporters must follow the principle of reading time. That is, read 2.00 p.m. "at 2 in the afternoon" or 7.00 a.m. " at 7 in the morning."

Task A 2 Reading Thai Related Material

(Students of Arts)

Instructions: The following is Official Information Act B.E. 2540. Read and summarize it. Then write a two-page report related to Public Relations. You have 25 minutes to do this. As you work through the task, speak out what you think, how you are doing the activity and whether that is helpful or successful.

The Official Information Act B.E. 2540 is available at
http://www.oic.thaigov.go.th/eng/statue/Statutedata.htm

Name________________________

Task A3 English Listening

(Students of Arts)

Instructions: You are to listen to the extract about "Truth Pays Dividends with Public." Listen to the extract and answer the following questions. You have 25 minutes to do this. As you work through the task, speak out your thoughts, how you are doing the activity and whether it is helpful or successful.

1. What is the speaker talking about?
   a. Truth b. Public Relations c. Company Crisis
2. What is the advantage of a long term cohesive public relations program?
   a. credibility b. good relationship c. a bank account
3. Which kind of programmes or activities characterize bad public relations?
   a. long term professional public relations program
   b. cohesive activities
   c. short term goals
4. What is the quagmire?
   a. Most people believe in what a company informs them of.
   b. People do not expect to hear the truth.
   c. Public relations give incorrect information all over America and Canada
5. The speaker strongly recommended the way to get out of the quagmire in no. 4. What is it?
   a. By telling people what they want to know.
   b. By telling half-truths.
   c. By making conscious choices to develop trust.
6. What did the speaker think about "slick and half- truth campaigns to win public opinion"?
   a. contemporary
   b. outdated
   c. up-to-date

(Tape Script)

TRUTH PAYS DIVIDENDS WITH PUBLIC

by : Jean Valin APR

Immediate Past President CPRS

Actions speak louder than words for companies trying to build trust

Good public relations is focused on long range pro-active application of on-going activities, orchestrating cohesive programs which builds over a period of time. It is like a savings account at the bank where you aim to make regular deposits and earn compound interest. Good public relations is about building relationships and when a crisis emerges, you have the net effect of your bank account - credibility - on your side.

Poor public relations on the other hand is the application of reactive activities and crisis management that are void of planned long term professional public relations program, focused on short term goals. These activities may look and sound good, but generally the results will not have a lasting effect.

The bottom line for public relations is that communicating credibility is tough and getting tougher. The public will discount what is said in any venue by almost any medium by a considerable amount - 30 to 50 per cent of the message will be immediately discounted. Even 140 years ago, Abraham Lincoln in a speech delivered in Bloomington, Illinois, declared: "You can fool all the people some of the time ; you can even fool some people all the time, but you can't fool all the people all the time."

A national public opinion survey commissioned in 1997 by the Canadian Public Relations Society (CPRS) on this issue found that on a comparative basis with a similar U.S. survey, Canadians are perceived to be a shade more honest than Americans. These surveys also found that both Canadians and Americans do not perceive honesty on the job as being a black and white issue, but rather see it in shades of grey.

Half of respondents (48%) indicated that people are less honest now than they were ten years ago.

A majority of workers believe that fellow employees and management are fairly truthful, but not completely honest.

While most workers perceive people in the workplace to be generally honest, sizable numbers of Canadians acknowledge situations where honesty would give way to less than honest actions.

Whereas Canadian workers' answers follow a similar pattern to that of the United States workers, Canadians generally give slightly higher truthfulness ratings than American workers.

Canadian workers were asked how top management would react in various situations. Most (80%) believe that management would inform customers of a major mistake. Two out of three (64%) believe that management answer the press honestly.

Conversely, one out of three believe management would exaggerate business conditions to owners and shareholders and one out of four believe that management would hide company situations from outsiders.

From these findings it can therefore be concluded that people are not expecting to hear the truth and are discounting probably half of what they hear. This is most alarming for any organization that needs to market a product or message to the public. How do we get out of the quagmire? By making conscious choices to grow trust ; without the demonstration of trust within the organization and to the outside, no business strategy is going to be as effective as it could. It requires putting programs in place that will demonstrate behaviourally not theorically that the organization has concerned for its employees, suppliers, external audiences, clients or consumers.

Public relations is sometimes falsely referred to as 'smoke and mirrors'. But only by those who have never experienced its positive results, or who have run into incompetent practitioners.

Let us also consider what public relations will not do. It will not make up for deficiencies in your product and customer service operation. In a crisis, good public relations will reduce the negative impact, bad public relations will make matters worse. Intel found this out the hard way when information on the floating point defective Pentium chip became public. Public relations is not a substitute for corporate planning, nor can it turn any sales force into record-breaking stars. It should be noted that also, contrary to popular misconception, public relations will not create a positive image of a company that is poorly managed, a bad neighbour or has serious ethical problems.

Here's what public relations can do. It can target and educate your market's information gatekeepers - the analysts and the media - about your product or your position on an issue. And that is just an example of what can be done.

Dealing with public opinion in an age when the public has taken control of powerful communication channels like the Internet and the World Wide Web is a daunting task. Gone are the days when an organization could hope to manipulate public opinion with slick campaigns and half truths to win public opinion.

Organizations will always be well served by telling the truth. It takes a long time to build your credibility and an even longer time to rebuild it if you lose your credibility. This provides you all the more reason to practice good public relations and avoid the pitfalls of manipulation and disinformation - honesty pays.

Task A 4 English Reading
(Students of Arts)

Instructions: The following is an article related to public relations. Read it and prepare a 1-minute script to broadcast in a radio programme. You have 25 minutes to do this. As you work through the task, speak out your thoughts, how you are doing the activity and whether it is helpful or successful.

Writing Effective News Releases

Top Ten Tips for Writing Effective News Releases

by Tom Haibeck APR

The first rule of effective news writing is to make sure your story is *newsworthy*. Don't waste your time -- or the media's -- if what you're trying to communicate isn't newsworthy.

newsworthy (adj) = น่าสนใจเพียงพอที่จะเป็นข่าวได้

Possible newsworthy story *elements* for businesses include: the introduction of a *unique* new product or service; technological *breakthroughs*; new *trends* within your industry; *innovative* marketing *strategies*; high level *appointments*; business success or failure; and *philanthropic* activity.

element (n) = พื้นฐาน, ปัจจัยสำคัญ
unique (adj) = ลักษณะ /เรื่องพิเศษเฉพาะ
breakthrough (n) =การพัฒนาอย่างมากมายยิ่ง, การก้าวหน้าทางวิทยาศาสตร์ครั้งสำคัญยิ่ง
trend (n) = แนวโน้ม, ทิศทาง
innovative (adj) = เกี่ยวกับสิ่งใหม่/นวตกรรม
strategy (n) = กลยุทธ์, วิธีการ
appointment (n) = การแต่งตั้งให้ดำรงตำแหน่ง
philanthropic (adj)= ใจบุญสุนทาน

Rule number two is to keep it short and punchy. Reporters learn quickly that words are *precious* and not to be wasted -- if readers lose interest early in the story, they won't be around for the end of it.

precious (adj)=มีค่า, ล้ำค่า

The same *applies* to the attention span of editors. If you don't *grab* their attention within the first few paragraphs of a news release, it's probably too late. Therefore, try to summarize the most important facts about the story—the who, what, where, when and why—in your lead (the first one or two paragraphs of the news release).

apply (v) = ใช้ (ประโยชน์), ประยุกต์
grab (v) = จับ

Limit your news release to one page, if possible. Single space your release if you need to, and consider adding a fact sheet (simple, factual background information about the subject matter) as *supplementary* information.

limit (v) = จำกัด
supplementary (adj) = ประกอบ, เสริม, เพิ่มเติม

Here are eight more tips for writing effective news releases.

Make sure the information is timely. All media *outlet*s are bound by deadlines. Magazines, for example, have much different deadlines than radio newscasts. Find out what they are, and be strategic in releasing your information. Use a courier service, fax machine or e-mail to send the information, and always remember to put a date on your news release.

outlet (n)= การออก (จำหน่าย/เผยแพร่)

Make sure the information is accurate. Triple check your facts and figures, and make sure you *attribute* third-party information to a *legitimate* source. Opinions ("we think our widget works best") should be expressed in the form of quotations(said Mr. Mertz).

Attribute (v) = ถือเอา, ให้เหตุผล, อ้างเหตุผล
Legitimate (adj) = ถูกต้องตามกฎหมาย/ทำนองคลองธรรม/ธรรมเนียมประเพณี

Make sure the information is relevant. The North Shore News probably won't be interested in the business activities of Richmond based businesses. News must be of interest to the specific community for which it is *intended*.

Intend (v) = มีเจตนา, มุ่งหมาย, ตั้งใจ

Pre-sell your story. Employ the same technique newspapers use to attract reader interest: write a *catchy* headline for your story. The headline should not only summarize your story, it should also capture the *recipient*'s attention (e.g. "2000 Year Old Chinese Warlord Guides Fortunes of Richmond Financial Institution").

Catchy (adj) = ดึงดูดใจ, จำได้ง่าย

Recipient (n) = ผู้รับ (ข่าว)

Make sure the information is easy to read and understand. Use simple, declarative sentences to make your point. Avoid industry *jargon*. Ask someone else to proofread your release for spelling, grammatical and *typographical* errors. And make sure the final version you send out is a clean, crisp copy free of smudges and last night's dinner stains. Avoid advertising *puffery*. One of the quickest ways to turn off a journalist is to use a lot of *hyperbole*. Business writers do not view themselves as promoters of your company, and neither should you. Keep your media correspondence simple and direct. Include a contact person. It's amazing how many news releases do not contain the name and phone number of the person who wrote it. Journalists need to know who to contact to *verify* the information -- or to seek out additional information on the subject matter. Consider adding your cellular/home phone numbers as well

Jargon (n) =ภาษาเฉพาะอาชีพ

Typographical (adj) = เกี่ยวกับเทคนิคการเรียงพิมพ์

Puffery (adj) = การยกย่อง/โฆษณาเกินจริง

Hyperbole (n) = สำนวนที่เกินจริง

Verify (n) = ตรวจสอบ/ยืนยันความถูกต้อง

Target your efforts. Don't flood media outlets with your news releases. Take the time to find out who covers your industry and direct your material to that specific individual(and make

sure you spell their name correctly). Also, try to keep your media lists current, as media people *tend to* move around a lot
.

Consider calling a *professional*. If your efforts at "getting link" are proving *futile*, consider hiring a professional public relations practitioner. Working with the news media isn't brain *surgery*, but it can be extremely *frustrating*, *time-consuming* and even dangerous if you don't know what you're doing (just like trying to do your own *plumbing*). By using a professional, you'll vastly increase your chances of *generating* the kind of *coverage* you desire, and you'll probably save a few trees as well

Tend to (v)= มัก, ชอบ, โน้มเอียง

Professional (n) =ผู้เชี่ยวชาญ, มืออาชีพ
Futile (adj)=ไร้ผล, ไร้ประโยชน์, หาความจริงไม่ได้, ขี้ปะติ๋ว, ไม่มีความสำคัญ
Surgery (n)= การผ่าตัด
Frustrating (adj)= ทำให้ผิดหวัง
Time-consuming(adj)= เสียเวลานาน
Plumbing (n) = การต่อท่อน้ำ
Generate(v)= ทำให้เกิด
Coverage (n)= การรายงานข่าว การตีพิมพ์ข่าวหรือออกข่าว

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Appendix 3.9: Tasks for Agricultural Students

Task S 1 Listening to a Lecture
(Agricultural Science)

Instructions: You are listening to a 15-minute lecture related to Biology- Probability and Goodness of Fit. After the lecture do the exercise below. You have 25 minutes to do this. As you work through the task, speak out your thoughts, how you are doing the activity and whether that is helpful or successful.

Exercise

1. In tossing three coins simultaneously, what is the probability, in one toss, of (a) three heads, (b) two heads and one tail?
2. A couple has two girls and is expecting a third child. They hope it will be a boy. What is the probability that their wish will be realized?
3. Albinism is recessive, as are blue eyes. (Albinos have blue eyes.) What is the probability that 2 brown-eyed persons, heterozygous for both traits, produce (remembering epistasis)

   3.1 albino children?
   3.2 albino sons?
   3.3 blue-eyed daughters and a brown-eyed son?
   3.4 sons genotypically like their father and 2 daughters genotypically like their mother?

PROBABILITY AND GOODNESS OF FIT

TWO INDEPENDENT, NONGENETIC EVENTS

Compiled by Dr. Sunpuni Aoki
Rajabhat Institute Ubonratchathani

Single-Coin Tosses
Two-Coin Tosses
Four-Coin Tosses
The Binomial expression
Genetic application of the binomial

Task S 2 Reading Thai Related Material
(Science Students)

Instructions: The following is an article related to genetics. Read and summarize it and write a two-page report on the innovation. You have 25 minutes to do this. As you work through the task, speak out your thoughts, how you are doing the activity and whether it is helpful or successful.

Cloning

Source: http://library.thinkquest.org/24355/data/details

Task S3 English listening
(Science Students)

Instructions: You are to listen to the extract about Biochemistry. Listen and answer the following questions. You have 25 minutes to do this. As you work through the task, speak out your thoughts, about how you are doing the activity and whether it is helpful or successful.

Exercise

1. What is the main purpose of biochemistry?
   a. To study of the substances found in living organisms.
   b. To study of the chemical reactions underlying life processes.
   c. To understand the structure and behavior of biomolecules.
2. What are the carbon-containing compounds that make up the various parts of the living cell and carry out the chemical reactions that enable it to grow, maintain and reproduce itself and use and store energy?
   a. Biomolecules b. organisms c. chemical reactions
3. Which classes of biomolecules are made up of bases and responsible for storing and transferring genetic information?
   a. nucleic acids b. proteins c. carbohydrates
4. Which proteins are of greatest interest to biochemists?
   a. amino acids b. lipids c. enzymes
5. Which classes of biomolecules are used as raw material to produce other biomolecules?
   a. enzymes b. carbohydrates c. lipids
6. Why do biochemists need to understand metabolism well enough to predict and control changes in cells?
   a. To treat many metabolic diseases
   b. To yield many metabolic diseases
   c. To predict many metabolic diseases

(Tape script)

Biochemistry

Contributed By: Mary Lynn Hendrix, B.A.

Biochemistry, study of the substances found in living organisms, and of the chemical reactions underlying life processes. This science is a branch of both chemistry and biology; the prefix bio- comes from bios, the Greek word for “life.” The chief goal of biochemistry is to understand the structure and behavior of biomolecules. These are the carbon-containing compounds that make up the various parts of the living cell and carry out the chemical reactions that enable it to grow, maintain and reproduce itself, and use and store energy.

A vast array of biomolecules is present in the cell. The structure of each biomolecule determines in what chemical reactions it is able to participate, and hence what role it plays in the cell’s life processes. Among the most important classes of biomolecules are nucleic acids, proteins, carbohydrates, and lipids.

Nucleic acids are responsible for storing and transferring genetic information. They are enormous molecules made up of long strands of sub units, called bases, that are arranged in a precise sequence. These are “read” by other components of the cell and used as a guide in making proteins.

Proteins are large molecules built up of small sub units called amino acids. Using only 20 different amino acids, a cell constructs thousands of different proteins, each of which has a highly specialized role in the cell. The proteins of greatest interest to biochemists are the enzymes, which are the “worker” molecules of the cell. These enzymes serve as promoters, or catalysts, of chemical reactions.

Carbohydrates are the basic fuel molecules of the cell. They contain carbon, hydrogen, and oxygen in approximately equal amounts. Green plants and some bacteria use a process known as photosynthesis to make simple carbohydrates (sugars) from carbon dioxide, water, and sunlight. Animals, however, obtain their carbohydrates from foods. Once a cell possesses carbohydrates, it may break them down to yield chemical energy or use them as raw material to produce other biomolecules.

Lipids are fatty substances that play a variety of roles in the cell. Some are held in storage for use as high-energy fuel; others serve as essential components of the cell membrane.

Biomolecules of many other types are also found in cells. These compounds perform such diverse duties as transporting energy from one location in the cell to another, harnessing the energy of sunlight to drive chemical reactions, and serving as helper molecules (cofactors) for enzyme action. All these biomolecules, and the cell itself, are in a state of constant change. In fact, a cell cannot maintain its health unless it is continually forming and breaking down proteins, carbohydrates, and lipids; repairing damaged nucleic acids; and using and storing energy. These active, energy-linked processes of change are collectively called metabolism. One major aim of biochemistry is to understand metabolism well enough to predict and control changes that occur in cells. Biochemical studies have yielded such benefits as treatments for many metabolic diseases, antibiotics to combat bacteria, and methods to boost industrial and agricultural productivity. These advances have been augmented in recent years by the use of genetic engineering techniques.

Task S 4 English Reading
(Science Students)

Instructions: The following is an article about Nuclear Transfer. Read and summarize it to report within three minutes. You have got 25 minutes to do this. As you work through the task, speak out your thoughts, about how you are doing the activity and whether that is helpful or successful.

Nuclear Transfer

Source: http://library.thinkquest.org/24355/data/details/techniques/nucleartransfer.html

Nuclear transfer first explored by Hans Spemann in the 1920's to conduct genetics research, nuclear transfer is the technique currently used in the cloning of adult animals. A technique known as twinning exists, but can only be used before an organism's cells *differentiate*. All cloning experiments of adult mammals have used a variation of nuclear transfer. Nuclear transfer requires two cells, a donor cell and an oocyte, or egg cell. Research has proven that the egg cell works best if it is *unfertilized*, because it is more likely to accept the donor nucleus as its own. The egg cell must be *enucleated*. This *eliminates* the majority of its genetic information. The donor cell is then forced into the Gap Zero, or GO cell *stage*, a *dormant* phase, in different ways depending on the technique. This dormant phase causes the cell to shut down but not die. In this state, the nucleus is ready to be accepted by the egg cell. The donor cell's nucleus is then placed inside the egg cell, either through cell *fusion* or *transplantation* . The egg cell is then prompted to begin forming an embryo. When this happens, the embryo is then transplanted into a *surrogate mother*. If all is done correctly, occasionally a perfect *replic*a of the donor animal will be born. Each group of researchers has its own specific technique. The best known is the **Roslin technique**, and the most effective and most recently developed is the **Honolulu technique.**

Conduct (v) = ทำ

Differentiate (v)= แสดงลักษณะพิเศษ

Unfertilized (v)= ยังไม่ได้รับการผสมพันธ์

enucleate(v) = ใส่นิวเคลียสไว้ข้างใน

Eliminate(v) = ทำลาย , กำจัด, ลบทิ้ง

Dormant = ไม่เคลื่อนไหว, อยู่นิ่ง ๆ

Fusion(n)= การหลอมละลาย

Transplantation(n) = การปลูกถ่าย

Surrogate mother = แม่(รับตั้ง)ท้อง

Replica (n)= รูป/ของจำลอง

The Roslin Technique

The cloning of Dolly has been the most important event in cloning history. Not only did it spark *public* interest in the subject, but it also proved that the cloning of adult animals could be *accomplished*. Previously, it was not known if an adult nucleus was still able to produce a completely new animal. Genetic damage and the simple *deactivation* of genes in cells were both considered possibly *irreversible.* The realization that this was not the case came after the discovery by Ian Wilmut and Keith Cambell of a method with which to *synchronize* the cell cycles of the donor cell and the egg cell. Without synchronized cell cycles, the nucleus would not be in the correct state for the embryo to accept it. Somehow the donor cell had to be *forced* into the Gap Zero, GO cell stage, or the dormant cell stage. First, a cell (the donor cell) was selected from the *udder* cells of a finn

Public (n) = ประชาชน

Accomplish (v)= ทำได้สำเร็จ

Deactivation (n)= ทำให้อยู่นิ่ง ๆ/ไม่มีชีวิต

Irreversible (adj)= ไม่สามารถมีชีวิตได้อีก

Synchronize(v)= ทำในเวลาเดียวกัน ทำให้เกิดพร้อมกัน

Force(v)=บังคับ เร่ง

Udder(n)=เต้านม

Dorset sheep to provide the genetic information for the clone. For this experiment, the researchers allowed the cell to divide and form a culture in vitro, or outside of an animal. This produced multiple copies of the same nucleus. This step only becomes useful when the DNA is altered, such as in the case of Polly, because then the changes can be studied to make sure that they have taken effect. A donor cell was taken from the culture and then starved in a mixture which had only enough nutrients to keep the cell alive. This caused the cell to reach the GO stage. The egg cell of a Blackface *ewe* was then enucleated and placed next to the donor cell. One to eight hours after the removal of the egg cell, an electric pulse was used to fuse the two cells together and at the same time, activate the development of an embryo. This technique for *mimicking* the activation provided by sperm is not completely correct, since only a few electrically activated cells survive long enough to produce an embryo. If the embryo survives, it is allowed to grow for about six days, *incubating* in a sheep's oviduct. It has been found that cells placed in oviducts early in their development are much more likely to survive than those incubated in the lab. Finally, the embryo is placed into the uterus of a surrogate mother ewe. That ewe then carries the clone until it is ready to give birth. Assuming nothing goes wrong, an exact copy of the donor animal is born. This newborn sheep has all of the same chatacteristics of a normal newborn sheep. It has yet to be seen if any adverse effects, such as a higher risk of cancer or other genetic diseases that occur with the gradual damage to DNA over time, are presented in Dolly or other animals cloned with this method.

Ewe(n)=แกะตัวเมีย

Mimic(v)=จำลอง

Incubate(v)=ฟักตัว

The Honolulu technique

In July of 1998, a team of scientists at the University of Hawaii announced that they had produced three *generations* of genetically *identical* cloned mice. The technique is accredited to Teruhiko Wakayama and Ryuzo Yanagimachi of the University of Hawaii. Mice had long been held to be one of the most difficult mammals to clone due to the fact that almost immediately after a mouse egg is fertilized, it begins dividing. Sheep were used in the **Roslin technique** because their eggs wait several hours before dividing, possibly giving the egg time to reprogram its nucleus. Even without this luxury, Wakayama and Yanagimachi were able to clone with a much higher success rate (Three clones out of every one-hundred *attempts*) than Ian Wilmut (one in 277). Wakayama *approached* the problem of synchronizing cell cycles differently than Wilmut. Wilmut used udder cells, which had to be forced into the GO stage. Wakayama *initially* used three types of cells, Sertoli cells, brain cells, and cumulus cells. Sertori and brain cells both remain in the Go state naturally and cumulus cells are almost always in either the GO or G1 stage.
mouse egg cells were used as the recipients of the donor nuclei. After being enucleated, the egg cells had donor nuclei *inserted* into them. The donor nuclei were taken from cells within minutes of the each cell's *extraction* from a mouse. Unlike the process used to create Dolly, now in vitro, or outside of an animal, *culturing* was done on the cells. After one hour, the egg cell was then placed in a chemical culture to jumpstart the cell's growth, just as fertilization does in nature. I n the culture was a substance (cytochalasin B) which stopped the formation of a polar body, a second cell which normally forms before fertilization. The polar body

Generation(n) = รุ่น
Identical(adj)=เหมือนกันทุกประการ

Attempt(n) = ความพยายาม
Approach(v) = แก้ปัญหา

Initially(adv) =เริ่ม

Insert (v) = ใส่เข้าไป
Extraction(n) = การถอด/ดึงออกจาก
Culture(v) = เพาะเลี้ยง

would take half of the genes of the cell, preparing the other cell to receive genes from sperm. After being jumpstarted, the cells develop into embryos. These embryos can then be transplanted into surrogate mothers and carried to term. The most successful of the cells for the process were cumulus cells, so research was *concentrated* on cells of that type. After providing that the technique was *viable*, Wakayama also made clones of clones and allowed the original clones to give birth normally to prove that they had full reproductive functions. At the time he *released* his results, Wakayama had created fifty clones. This new technique allows for further research into exactly how an egg reprograms a nucleus, since the cell functions and genomes of mice are some of the best understood. Mice also reproduce within months, much more rapidly than sheep. This aids in researching long term results.

Concentrate(v) = ให้ความสนใจ
Viable(adj) = ชีวิตและเจริญเติบโตได้
Release(v)= ประกาศข่าว

Appendix 3.10: Think-Aloud Checklist

Name____ Area of Study: ___Arts___ Science
Task:___Listening___Reading ; _____ Major subject conten ___ English Observer's name: Chayada Danuwong
Date & Time: 1st observation ___________________________
2nd observation____________________________

@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@

Directions: Please observe the informant's behaviors while he/she is doing the task assigned and write them on the following chart.

Planning	Relevance/ Use		Time of Recording			Monitoring	Relevance/ Use		Time of Recording		
	R	U	1-5	11-15	21-25		R	U	1-5	11-15	21-25
1. Goal setting						1. Comprehension check					
2. Directing attention selectively						2. Checking progress					
3. Linking with prior knowledge						3. Detecting weaknesses/obstacles					
4. Expecting the encountered problem						4. Seeking related prior knowledge					
5. Intending to ignore distractions						5. Checking the retrieval of required information					
6. Preparing to confront obstacles						6. Checking the attention					
7. Predicting outcomes/ answers						7. Checking appropriateness of the strategy being used					
8. Predicting the incoming information						8. Checking importance of the information					
9. Choosing strategies for the task						9. Checking the linkage to other subjects					
10. Work ordering						10. Checking correctness of the predictions/answers					

Continues over

Continued

Problem-solving	R	U	1-5	11-15	21-25	Evaluating	R	U	1-5	11-15	21-25
1. Revising the plan						1. Judging that the goal has been met					
2. Accessing various resources						2. Assessing strategy use					
3. Ignoring problems						3. Within subject applicability					
4. Asking for clarification						4. Other area applicability					
5. Linking with prior knowledge						5. Seeking other suitable strategy					
6. Seeking peer support						6. Summarizing ideas/lessons					
7. Trying alternatives						7. Judging how much learned					
8. Making (new) guesses						8. Assessing correctness of predictions/answers					
9. Logic reasoning						9. Comparing new knowledge with known knowledge					
10. Self encouragement						10. Judging worthiness of learning					

Appendix 3.11: The Self-report Instruction for Students

Learners' s Self reports

Suggestions: A. Learning subjects in the disciplines. You are requested to write about your learning behaviours in studying a subject in your field. Write as much as you can in your report about how you listen to a lecture and read related documents. Be specific and descriptive of actions, students, events and reactions that you have before and while listening to a lecture or reading a document as well as after you have finished that listening or reading. Record the feelings you have about your practices and the various events that happened. **(You may keep in mind a subject that is the most important to you if it helps.)**

Continues over

-Continued-

B. Learning English as a foreign Language. Use the above suggestions in writing about your English learning and reading tasks in particular.

Appendix 3.12: The Self-report Instruction for Instructors

Instructor's Self reports

Suggestions: You are requested to write about your teaching concerning how you help your students being independent learners. Write as much as you can in your report. Be specific and descriptive of actions, students, events and reactions that you have before teaching, while teaching and after teaching. Record the feelings you have about your practices and the various events that happened. **(You may keep in mind a subject that is the most important to you if it helps.)**

Appendix 3.13: A summary of codes and their actual practices in learning

Planning	Actual Practice in the MSC	Actual Practice in English
1. Making a plan	Thinking in advance how to accomplish listening or reading.	Thinking in advance how to accomplish listening or reading
2. Extra reading	Reading complementary documents suggested by the instructor.	-
3. Making a time frame	Scheduling a time table for reading practice.	Scheduling a time table for listening/reading practice.
4. Managing resources	Considering (trustworthiness of) sources/information; Grouping/ categorising information/ knowledge	-
5. Pre-reviewing concepts	Reviewing knowledge/ideas essential for learning before class/ reading	Reviewing knowledge about phonology, morphology, words and grammar before listening/ reading
6. Spending extra time to study/practice	Studying/practising outside the classroom.	Studying/practising outside the classroom.
7. Preparing for class	Bringing handouts, notebooks and textbooks into class.	Bringing dictionaries, textbooks, notebooks, workbooks to class.
8. Arriving class on time	Arriving class on time	Arriving class on time
9. Selecting a seat	Selecting a seat	Selecting a seat
10. Effort directed	Trying hard.	Intending to try hard/ to understand what listen or read.
11. Thinking in advance about/discussing the topic	Thinking in advance about/discussing the topic.	Thinking in advance about/discussing the topic.
12. Intending to concentrate in class	Intending to concentrate in class.	Intending to concentrate in class.
13. Pre-reading	Reading handouts/textbooks before class.	Reading textbooks, workbooks before class.
14. Consulting a dictionary	-	Looking the words up in a dictionary.
15. Memorising words/ information	-	Trying to remember words/ information
16. Keeping a vocabulary list	-	Recording unfamiliar word list.
17. Reviewing the notes/ vocabulary list	-	Reviewing the notes/ vocabulary list

Continues over

Appendix 3.13—Continued

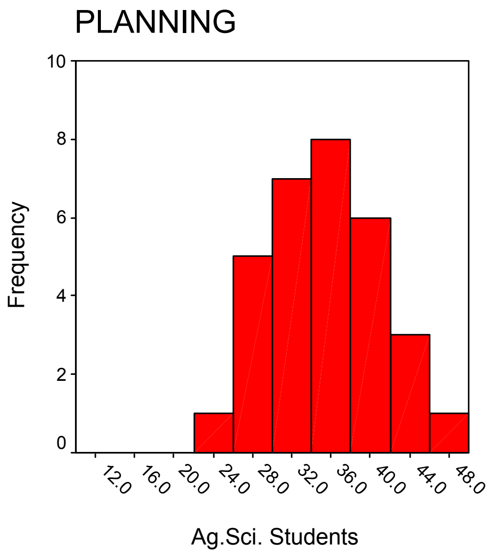
Monitoring	Actual Practice in the MSC	Actual Practice in English
1. Self-examination	Checking preference, ability and/or attitude towards learning activities.	Checking preference, ability and/or attitude activities.
2. Distinguishing appropriate ness from inappropriateness	Deciding whether the information/action is appropriate.	-
3. Note-taking	Writing down information/ knowledge	Writing down or underlying important parts, unfamiliar words/phrases/sentences.
Problem-solving	**Actual Practice in the MSC**	**Actual Practice in English**
1. Solving it alone	Trying to solve a problem alone.	-
2. Asking for help	Asking friend or more experienced person for help.	Asking friend or more experienced person for help.
3. Looking for solutions	Looking for suitable solutions.	-
4. Consulting the instructor	Asking for instructors' comments/ suggestions/resources.	Asking instructors to repeat the unclear parts.
5. Making revisions	Correcting mistakes/ misunderstanding.	Correcting mistakes/ misunderstanding.
6. Discussing the problem	Discussing the problems with friends/more experienced people.	Discussing the problems with friends/more experienced people.
7. Concentration in class	Directing attention to the lecture/reading.	Directing attention to listening/reading.
8. Trying to figure out main ideas	Trying to figure out main ideas.	Trying to figure out main ideas.
9. Doing nothing	Doing nothing.	Doing nothing.
10. Suppressing distractions/ inappropriate thoughts	Suppressing distractions/ inappropriate thoughts.	Suppressing distractions/ inappropriate thoughts.
11. Trying to resume concentration	Trying to resume concentration.	Trying to resume concentration.
12. Responding in class	Giving answers to questions, expressing ideas, sharing information/experiences.	Giving answer to questions.
13. Making understanding clear	Trying to understand the lecture/ reading.	Trying to understand what listen/ read.
14. Re-reading/listening repeatedly	Reading up to 5 or 6 times	Listening (the tape recorder) repeatedly.
15. Giving up	Giving up trying.	Giving up trying.

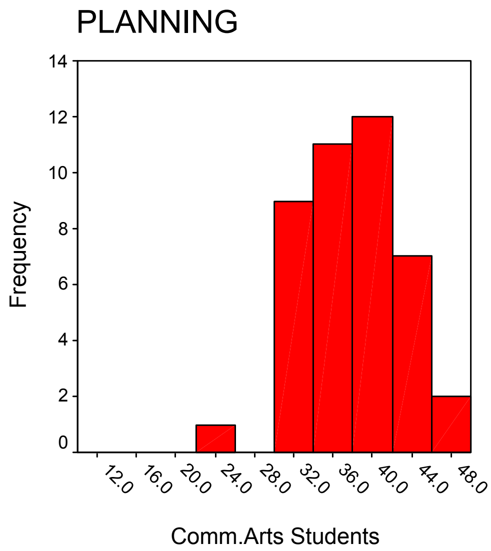
Continues over

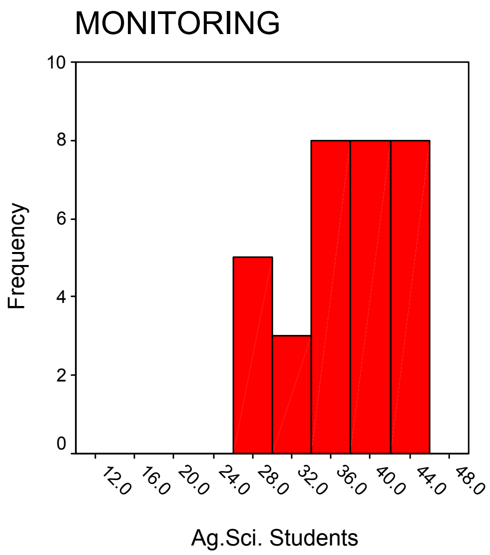
Appendix 3.13—Continued

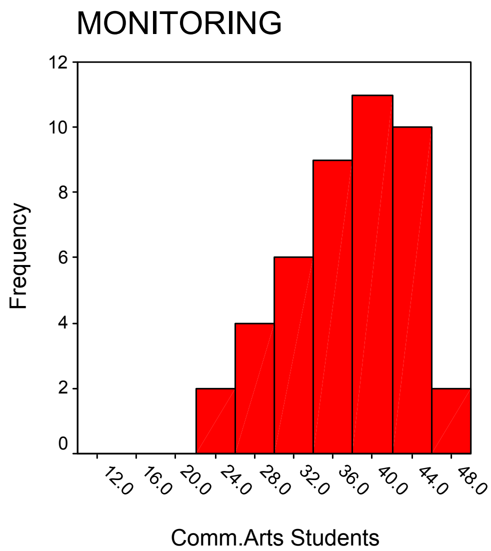
16. Working it out in a group	Working it out in a group.	Working it out in a group.
17. Using context clues	-	Using context clues to comprehend/guess meanings of unfamiliar words, phrases or texts.
18. Converting into L1	-	Converting into/recording the information in L1
19. Using hints/body language	-	Using hints/body language
20. Rehearsing	-	Imitating the words/phrases/ sentences
Evaluating	**Actual Practice in the MSC**	**Actual Practice in English**
1. Assessing learning/work	Judging learning activities/tasks.	Judging learning activities/tasks.
2. Detecting weaknesses/problems/failure	Addressing/noting failure/ weaknesses/problems after completing the class/reading.	Addressing/noting failure/ weaknesses/problems after listening/reading.
3. Assessing information/knowledge	Judging trustworthiness of knowledge/information; Distinguishing opinions from facts.	Judging challenges of language and linguistic features.
4. Refining ideas/skills	Connecting ideas/skills with existing learning; justifying ideas/skills.	Making changes in attitudes/ ideas/skills in a positive way.
5. Self-assessment	Assessing one's own ability, attitudes and/or attitudes after completing the class/reading.	Assessing one's own ability, attitudes and/or attitudes after completing listening/reading.
6. Applying learning to practice	Using theoretical knowledge in practical sessions.	Using new learned words, grammar in other skills such as speaking and/or writing.

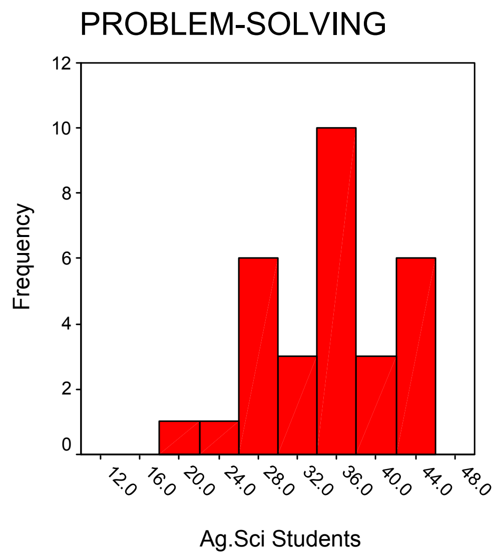
Appendix 5.1: STUDENTS: Patterns of Scores for Perceived Relevance of Metacognitive Processes in Learning Major Subject Content







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6
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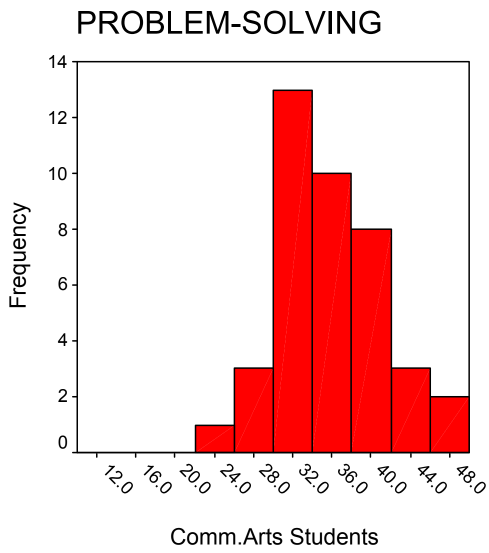
40.0
44.0
48.0
Ag.Sci Students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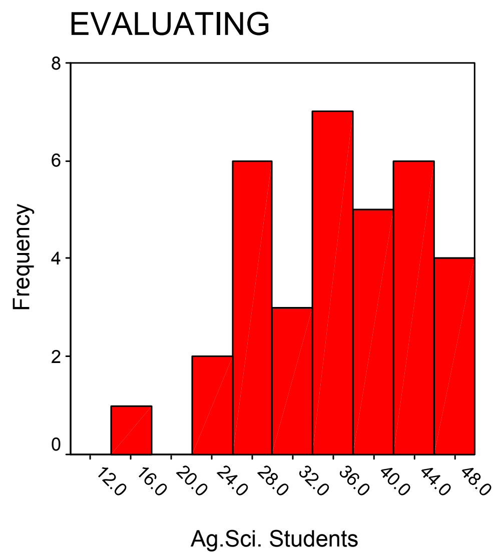
Comm.Arts Students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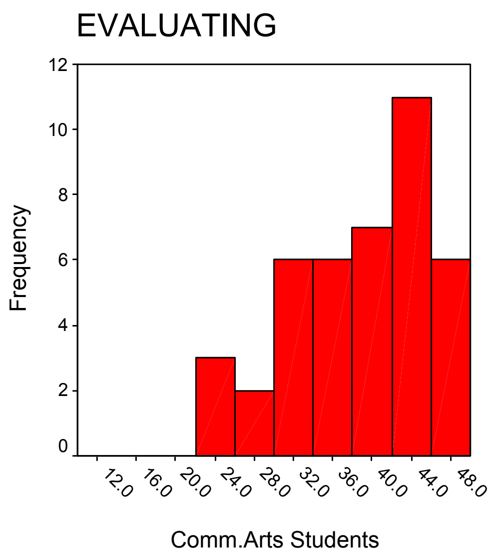
Ag.Sci. Students


EVALUATING
Frequency
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8
6
4
2
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12.0
16.0
20.0
24.0
28.0
32.0
36.0
40.0
44.0
48.0
Comm.Arts Students

Appendix 5.2: PERCEIVED RELEVANCE-Within group comparisons

Table 5.1a: AG.SCI. STUDENTS – Perceived relevance of metacognitive processes in learning MSC; *Wilcoxon Matched-Pairs Signed Ranks* Tests

	Monitoring		Problem-Solving		Evaluating	
	Z	***p***	**Z**	***p***	**Z**	***p***
Planning	-2.415	*0.016*	-0.140	*0.889*	-1.266	*0.205*
Monitoring			-3.593	*<0.001**	-2.175	*0.030*
Problem-Solving					-1.361	*0.173*

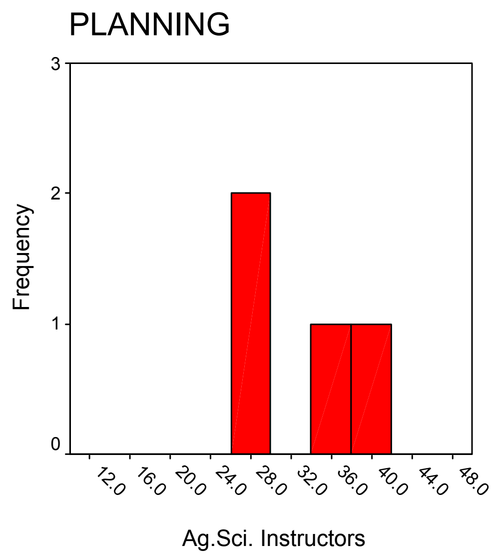
* Significant at or beyond the 0.008 level, as required after Bonferroni adjustment to maintain the per family Type 1 error rate at 0.05.

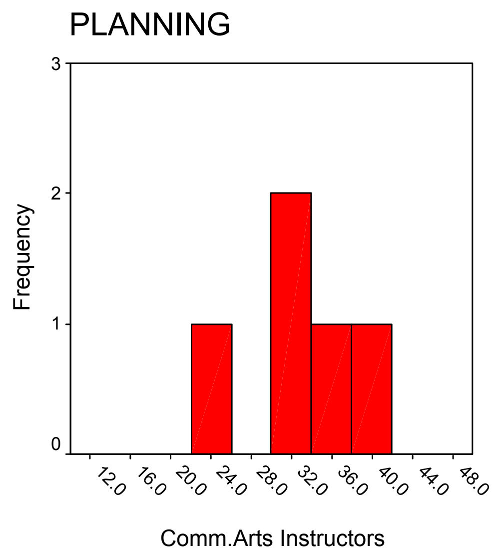
Table 5.1b: COMM.ARTS STUDENTS – Perceived relevance of metacognitive processes in learning MSC; *Wilcoxon Matched-Pairs Signed Ranks* Tests

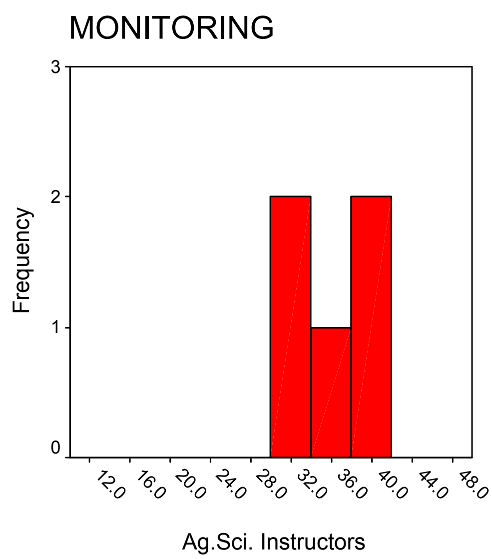
	Monitoring		Problem-Solving		Evaluating	
	Z	***p***	**Z**	***p***	**Z**	***p***
Planning	-0.598	*0.550*	-1.536	*0.125*	-1.460	*0.144*
Monitoring			-1.730	*0.084*	-2.119	*0.034*
Problem-Solving					-2.651	*0.008**

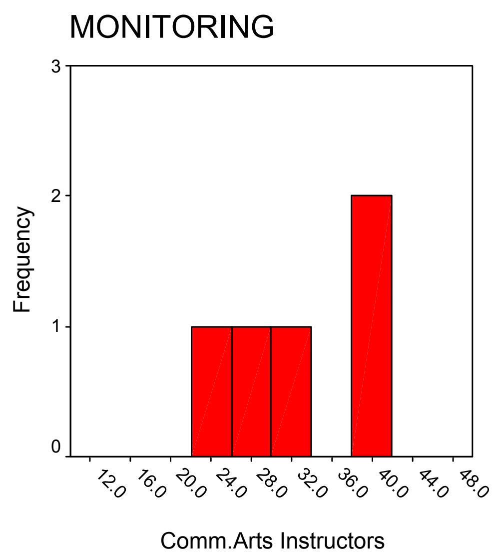
* Significant at or beyond the 0.008 level, as required after Bonferroni adjustment to maintain the per family Type 1 error rate at 0.05.

Appendix 5.3: INSTRUCTORS: Patterns of Scores for Perceived Relevance of Metacognitive Processes in Learning Major Subject Content









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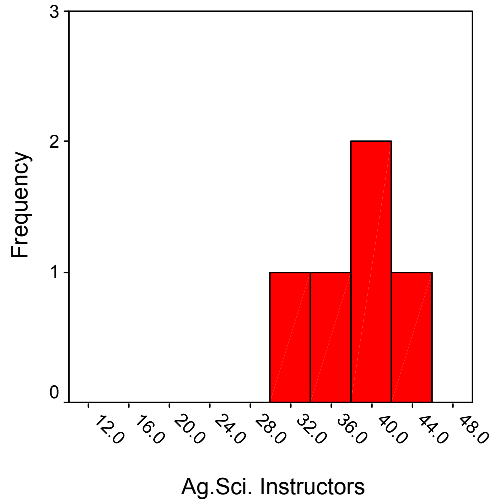
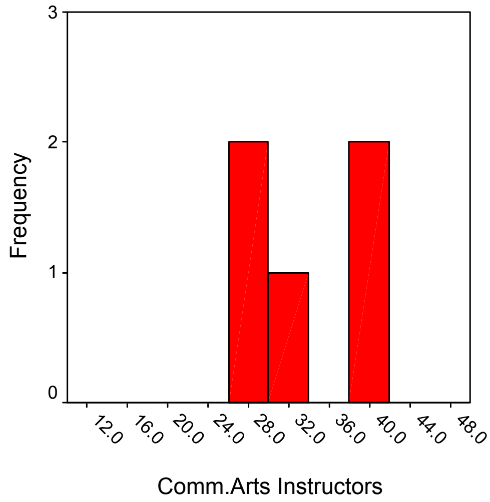


PROBLEM-SOLVING



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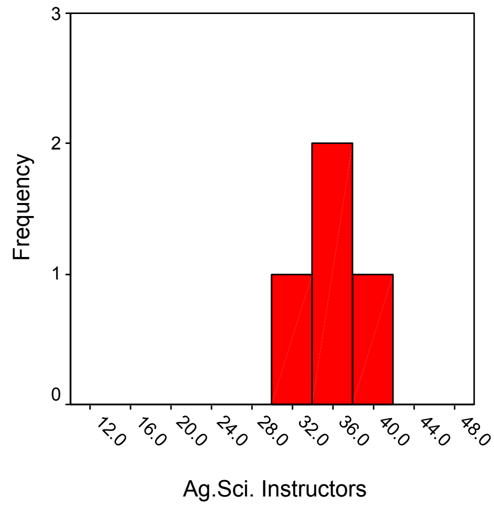
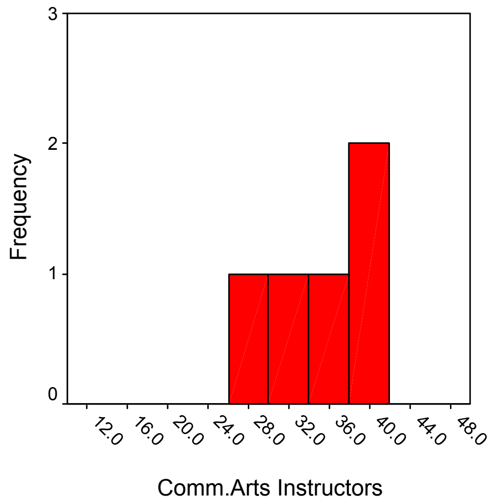
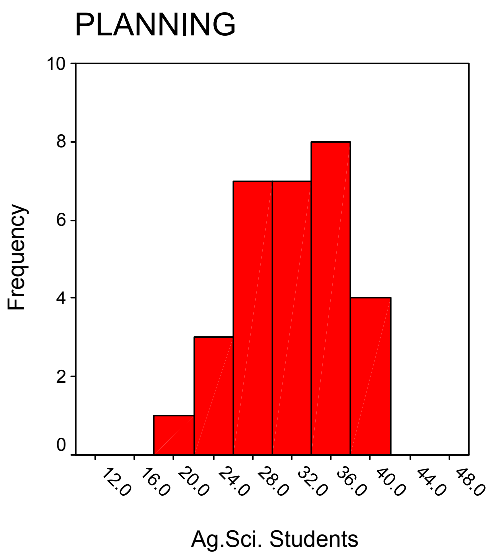
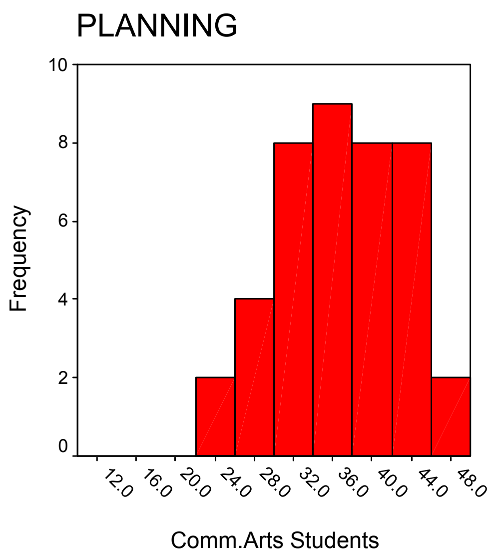


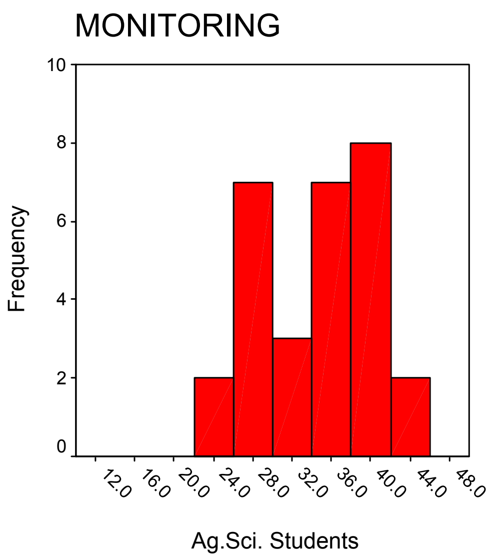
EVALUATING

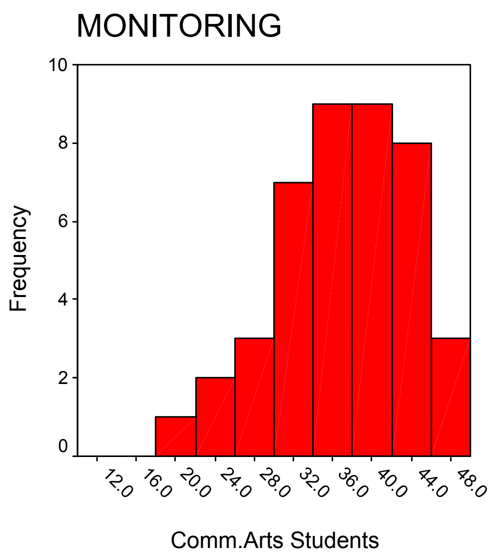


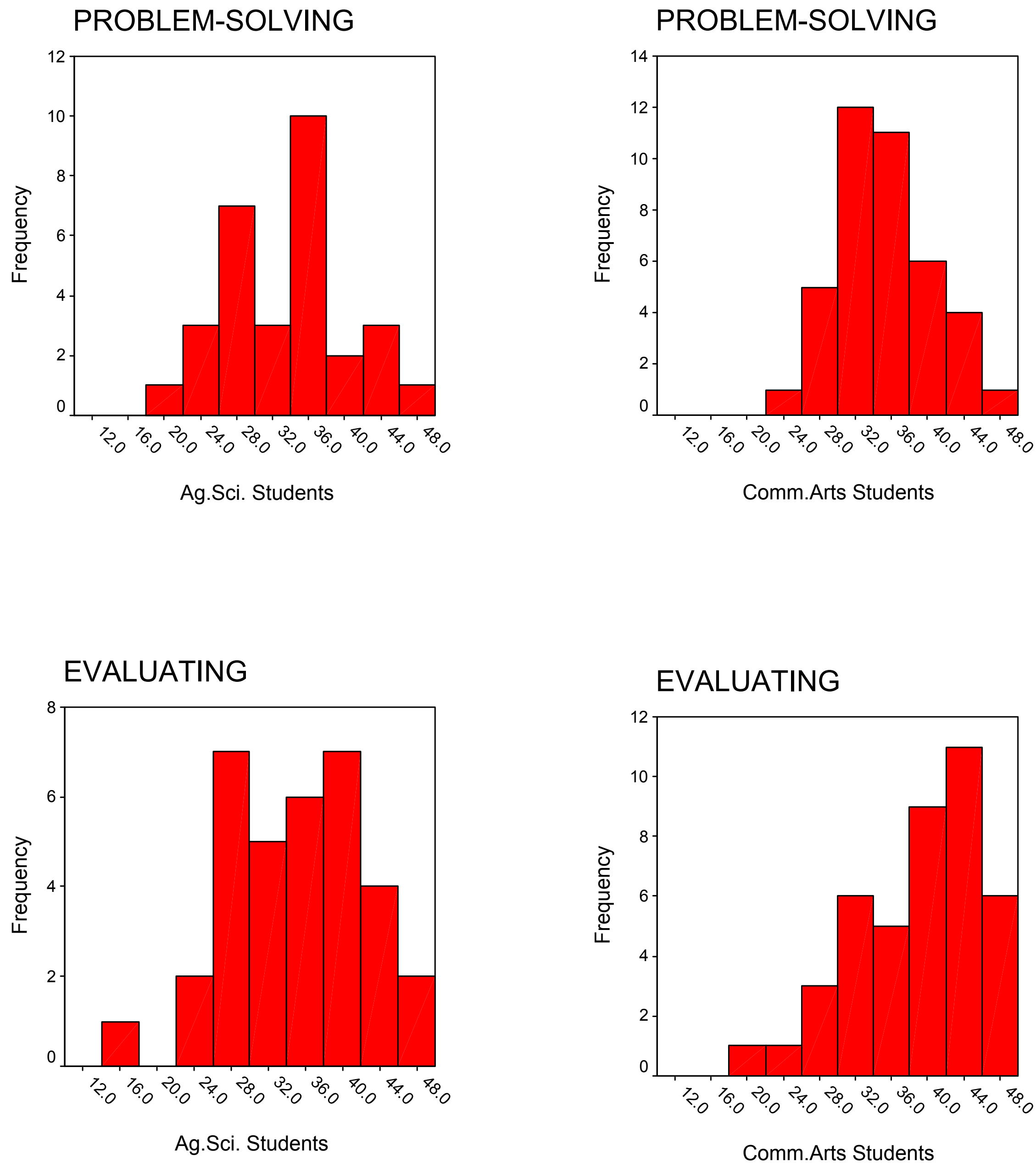
Appendix 5.4: STUDENTS: Patterns of Scores Use of Metacognitive Processes in Learning Major Subject Content











PROBLEM-SOLVING
Frequency
Ag.Sci. Students
PROBLEM-SOLVING
Frequency
Comm.Arts Students
EVALUATING
Frequency
Ag.Sci. Students
EVALUATING
Frequency
Comm.Arts Students

Appendix 5.5: USE-Within group comparisons

Table 5.11a: COMM.ARTS STUDENTS – Use of metacognitive processes in learning MSC; *Wilcoxon Matched-Pairs Signed Ranks* Tests

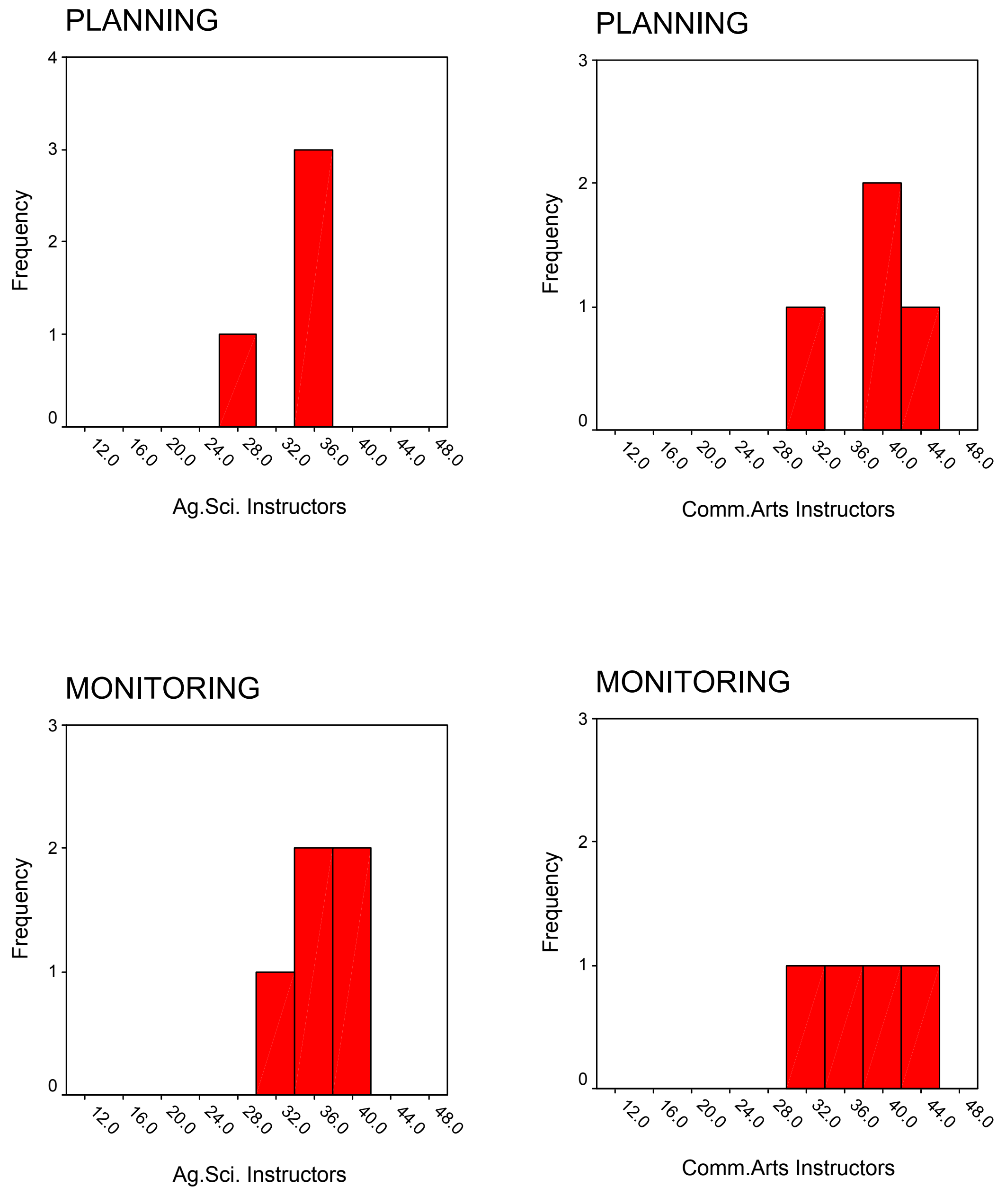
	Monitoring		**Problem-Solving**		**Evaluating**	
	Z	***p***	**Z**	***p***	**Z**	***P***
Planning	-1.007	*0.314*	-0.858	*0.391*	-2.061	*0.039*
Monitoring	-	-	-1.691	*0.091*	-2.204	*0.027*
Problem-Solving	-	-	-	-	-2.963	*0.003**

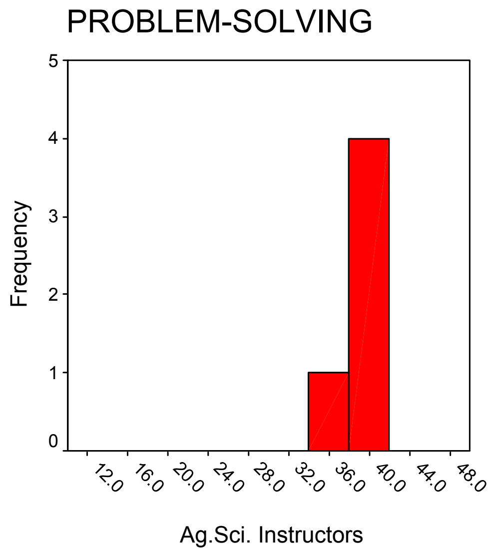
*Significant at the 0.008 level, as required after Bonferroni adjustment to maintain the per family Type 1 error rate at 0.05.

Table 5.11b:AGRI SCI STUDENTS - Use of metacognitive processes in learning MSC: pairwise comparisons using the *Wilcoxon Matched-Pairs Signed Ranks* Test

	Monitoring		**Problem-Solving**		**Evaluating**	
	Z	***p***	**Z**	***p***	**Z**	***P***
Planning	-2.179	*0.029*	-0.515	*0.606*	-2.520	*0.012*
Monitoring	-	-	-1.328	*0.184*	.000	*1.000*
Problem-Solving	-	-	-	-	-1.236	*0.216*

Appendix 5.6: INSTRUCTORS: Patterns of Scores Incorporation of Metacognitive Processes in Teaching Major Subject Content

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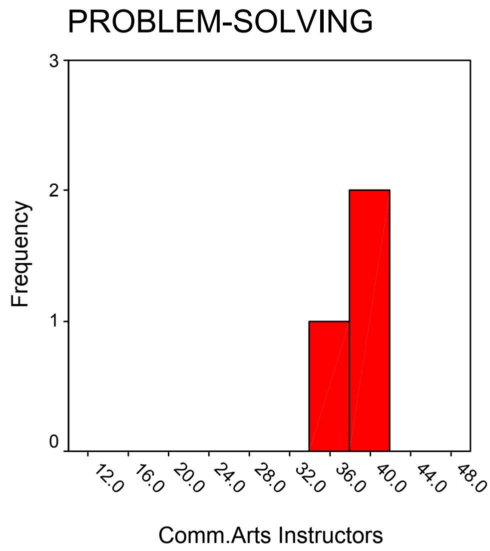
Frequency
Ag.Sci. Instructors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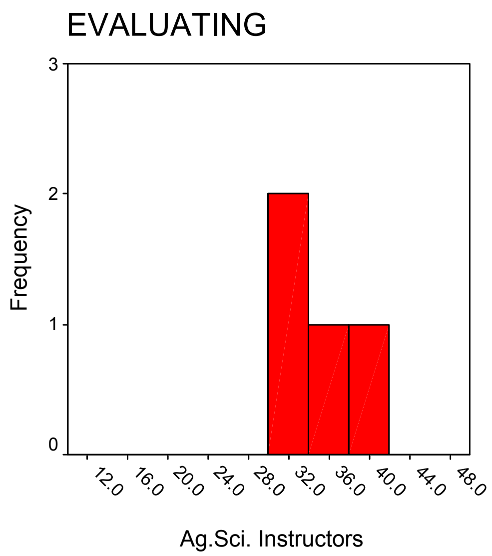
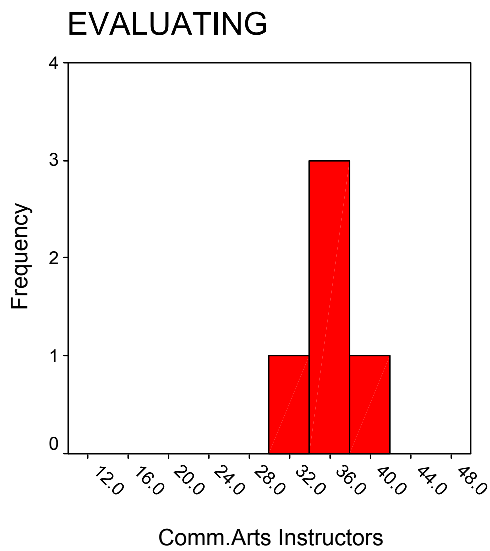
Frequency
Comm.Arts Instructors


EVALUATING
Frequency
Ag.Sci. Instructors


EVALUATING
Frequency
Comm.Arts Instructors

Appendix 7.1: PERCEIVED RELEVANCE – Tests of significant difference between MSC and English ratings

Table 7.1: STUDENTS – Perceived relevance of metacognitive processes in learning MSC vs English

	Wilcoxon Matched-Pairs Signed Ranks Test				
	N-ties[1]	Sums of Ranks[2]		Test Statistics[3]	
		NR	*PR*	Z	*p*
Agri.Sci (N = 34)					
Planning	29	191.5	*243.5*	-0.57	*0.57*
Monitoring	30	235.0	*230.0*	-0.05	*0.96*
Problem-Solving	24	160.5	*139.5*	-0.30	*0.76*
Evaluating	27	163.0	*215.0*	-0.63	*0.53*
Comm. Arts (N =44)					
Planning	32	226.0	*302.0*	-0.71	0.47
Monitoring	34	243.5	*351.5*	-0.92	0.35
Problem-Solving	32	308.5	*219.5*	-0.83	0.40
Evaluating	34	344.0	*251.0*	-0.80	0.42

1 'N-ties' is the number of participants minus the number of ties (i.e. where MSC and English were given exactly the same rating).

2 'NR' is the sum of the negative signed ranks (i.e. where MSC was rated higher than English); 'PR' is the sum of the positive signed ranks (i.e. where English was rated higher than MSC).

3 Two-tailed measurements

Appendix 7.2: USE – Tests of significant difference between MSC and English ratings

Table 7.2: STUDENTS - Use of metacognitive processes in learning MSC vs English

	Wilcoxon Matched-Pairs Signed Ranks Test				
	N-ties[1]	Sums of Ranks[2]		Test Statistics[3]	
		NR	*PR*	Z	*p*
Agri.Sci (N = 34)					
Planning	28	222.0	*184.0*	-0.44	*0.66*
Monitoring	24	185.5	*114.5*	-1.02	*0.31*
Problem-Solving	25	207.0	*118.0*	-1.20	*0.23*
Evaluating	26	233.0	*118.0*	-1.47	*0.14*
Comm. Arts (N =44)					
Planning	*33*	325.5	*235.5*	-0.81	*0.42*
Monitoring	*34*	*347.5*	*247.5*	-0.86	*0.39*
Problem-Solving	*33*	337.5	*223.5*	-1.02	*0.31*
Evaluating	*32*	390.0	*138.0*	-2.36	*0.02**

1 ‘N-ties’ is the number of participants minus the number of ties (i.e. where MSC and English were given exactly the same rating).

2 ‘NR’ is the sum of the negative signed ranks (i.e. where MSC was rated higher than English); ‘PR’ is the sum of the positive signed ranks (i.e. where English was rated higher than MSC).

3 Two-tailed measurements

Appendix 9.1: PLANNING STRATEGIES - Results from all approaches

Planning		Perceived Relevance												Use											
		Q'naire				Self reports				Think-aloud				Q'naire				Self reports				Think-aloud			
		ASci		CA		ASci		CA		ASci		CA		ASci		CAs		ASci		CA		ASci		CA	
		M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E
Goal setting .1	**L**					0	0	0	0	0	0	0	0	-	-	-		-	-	0	-	0	0	√	0
	R					-	0	0	0	0	0	0	0					-	-	-	-	√	0	√	0
2. Directing attention selectively	**L**	-		+	+	0	0	-	-	0	0	0	0	-				-	-	-	0	0	0	0	0
	R					0	0	0	0	0	0	0	0					-	-	-	0	√	0	√	0
3. Linking with prior knowledge	**L**			+	+	-	-	0	-	0	0	0	0	-	-	+		-	-	-	-	√	0	√	0
	R					0	-	0	-	0	0	0	0					0	-	0	-	√	√	√	√
4. Expecting the encountered problem	**L**	-		-	+	0	0	0	0	0	0	0	0	-		-		-	0	-	0	0	√	√	√
	R					0	0	0	0	0	0	0	0					0	0	0	0	√	√	√	√
5. Intending to ignore distractions	**L**	+	+	+	+	0	0	-	0	√	0	√	0	-	+	+		0	0	-	0	√	0	√	0
	R					0	0	0	0	√	0	√	0					0	0	0	0	√	0	√	0
6. Preparing to confront obstacles	**L**	+	+	+	+	-	0	0	0	0	0	0	0		+	+	+	-	0	-	-	√	√	√	√
	R					0	0	0	0	0	0	0	0					0	0	0	0	√	√	√	√
7. Predicting outcomes/ answers	**L**	-		-		0	0	0	0	0	0	0	0	-	-	-		-	0	-	0	√	√	0	0
	R					0	0	0	0	0	0	0	0					0	-	0	0	0	0	√	√
8. Predicting the incoming information	**L**	-		-		0	0	0	0	0	0	0	0	-	-			0	0	0	0	√	√	√	√
	R					0	0	0	0	0	0	0	0					0	0	0	0	√	√	√	√
9. Choosing strategies for the task	**L**	-		-		0	0	-	0	0	0	0	0	-				0	0	-	-	√	√	√	√
	R					0	0	0	0	0	0	0	0					-	0	-	-	√	√	√	√
10. Making a plan	**L**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	R					0	0	-	0	0	0	0	0					0	0	-	0	√	0	√	0
11. Extra reading	**L**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0
	R					0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0
12. Making a time frame	**L**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
	R					0	0	0	0	0	0	0	0					0	0	0	-	0	0	0	0
13. Accessing various resources	**L**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	-	0	0	0	0	0
	R					0	0	0	0	0	0	0	0					-	0	0	0	0	0	0	0
14. Managing resources	**L**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	R					0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0
15. Pre-reviewing concepts	**L**	0	0	0	0	-	0	-	0	0	0	0	0	0	0	0	0	-	-		-	√	0	√	0
	R					0	0	0	0	0	0	0	0					0	-	0	-	√	√	√	√
16. Work ordering	**L**	+	+	+	+	0	0	0	0	0	0	0	0			+	+	0	0	0	0	0	√	√	√
	R					0	0	0	0	0	0	0	0					0	0	0	0	√	√	√	√
17. Spending extra time to study/practice	**L**	0	0	0	0	-	0	0	-	0	0	0	0	0	0	0	0	-	-	0	-	0	0	0	0
	R					0	0	0	0	0	0	0	0					0	-	0	-	0	0	0	0
18. Preparing for class	**L**	0	0	0	0	-	-	-	-	0	0	0	0	0	0	0	0	-	-	-		0	0	0	0
	R					0	0	0	-	0	0	0	0					0	-	0	-	0	0	0	0
19. Arriving class on time	**L**	0	0	0	0	-	0	-	0	0	0	0	0	0	0	0	0	-	0	-	-	0	0	0	0
	R					0	0	0	0	0	0	0	0					0	0	0	-	0	0	0	0

Continues over

Appendix 9.1 – Continued

Planning		Perceived Relevance														Use											
		Q'naire				Self reports				Think-aloud				Q'naire				Self reports				Think-aloud			
		ASci		CA		Asci		CA		Asci		CA		Asci		Cas		Asci		CA		Asci		CA	
		M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E
20.Selecting a seat	**L**	0	0	0	0	-	0	-	-	0	0	0	0	0	0	0	0	-	0	-	-	0	0	0	0
	R					0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0
21.Effort directed	**L**	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	√	0	√
	R					0	0	0	0	0	0	0	0					0	0	-	0	0	√	0	√
22.Thinking in advance about/discussing the topic	**L**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	√	√	0	√
	R					0	0	0	0	0	0	0	0					0	0	0	-	0	√	0	√
23.Intending to concentrate in class	**L**	0	0	0	0	0	0	-	0	√	0	0	0	0	0	0	0	0	0	-	0	√	0	0	0
	R					0	0	0	0	0	0	0	0					-	0	-	0	0	0	0	0
24.Pre-reading	**L**	0	0	0	0	-	-	-	-	0	0	0	0	0	0	0	0	-	-	-	-	0	0	0	0
	R					0	-	0	-	0	0	0	0					0	-	-	-	0	0	0	0
25.Consulting a dictionary	**L**	0	0	0	0	0	-	0	-	0	√	0	√	0	0	0	0	0	-	0	-	0	√	0	√
	R					0	-	0	-	0	√	0	√					0	-	0	-	0	√	0	√
26.Memorising words/ information	**L**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
	R					0	0	0	0	0	0	0	0					0	0	0	-	0	0	0	0
27.Keeping a vocabulary list	**L**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	-	0	0	0	0
	R					0	0	0	-	0	0	0	0					0	-	0	-	0	√	0	√
28.Reviewing the notes/ vocabulary list	**L**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-		-	0	√	0	√
	R					0	0	0	0	0	0	0	0					-	-	-	-	0	√	0	√

- denotes the strategy attracts responses less than 30 %
+ denotes the strategy attracts responses higher than 60 %
(blank) denotes the strategy attracts responses about 30 – 59 %
√ denotes there is evidence for the strategy
0 denotes there is no evidence for the strategy
M denotes the MSC
E denotes English

Appendix 9.2: MONITORING STRATEGIES - Results from all approaches

Monitoring		Perceived Relevance												Use											
		Q'naire				Self reports				Think-aloud				Q'naire				Self reports				Think-aloud			
		ASci		CA		Asci		CA		Asci		CA		Asci		Cas		Asci		CA		Asci		CA	
		M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E
1.Comprehention check	**L**		+		+	0	0	0	-	0	0	0	0			+						√	√	√	√
	R					0	0	-	0	0	0	0	0					-		-		√	√	√	√
2.Checking progress	**L**	+	+	+	+	0	0	0	0	0	0	0	0			+		-	-	-	-	√	√	√	√
	R					0	0	0	0	0	0	0	0					0	-	0	0	√	√	√	√
3.Detecting weakness/obstacles	**L**	+	+	+	+	0	0	0	-	0	0	0	0	+	+	+	+	+	+	+		√	√	√	√
	R					0	0	0	0	0	0	0	0					-		-		√	√	√	√
4.Seeking related prior Knowledge	**L**		+	+	+	0	0	0	0	0	0	0	0			+	+	-	0	-	0	√	√	√	√
	R					0	0	0	0	0	0	0	0					0	0	0	0	√	√	√	√
5.Checking the retrieval of requireded information	**L**	+			+	0	0	0	0	0	0	0	0					-	0	-	0	√	0	√	√
	R					0	0	0	0	0	0	0	0					0	0	-	0	√	0	0	√
6.Checking the attention	**L**	+	+	+	+	0	0	0	0	0	0	0	0	+		+			-		-	0	0	0	0
	R					0	0	0	0	0	0	0	0					-	-	-	0	√	√	√	√
7.Checking appropriateness of the strategies being used	**L**	+				0	0	0	0	0	0	0	0					-	0	0	0	√	0	0	0
	R					0	0	0	0	0	0	0	0					0	0	0	0	√	0	√	0
8.Checking importance of information	**L**	+	+	+	+	0	0	0	0	0	0	0	0			+		0	0	-	0	√	0	√	0
	R					0	0	0	0	0	0	0	0					0	0	0	0	√	√	√	0
9.Checking the linkage to other subjects	**L**	+		+		0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0
	R					0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0
10.Checking correctness of the prediction	**L**					0	0	0	0	0	0	0	0		-	-		-	0	-	0	√	0	√	0
	R					0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0
11.Self-examination	**L**	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	-	-	-	-	√	√	√	√
	R					0	0	0	0	0	0	0	0					0	-	-	-	0	√	√	√
12.Distinguishing appropriateness from inappropriateness	**L**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	-	0	0	0	√	0
	R					0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0
13.Note-taking	**L**	0	0	0	0	-	-	-	-	√	0	0	0	0	0	0	0		-	+	-	√	√	√	√
	R					-	-	-	-	0	0	0	0					-	-	-	-	√	√	√	√

- denotes the strategy attracts responses less than 30 %
+ denotes the strategy attracts responses higher than 60 %
(blank) denotes the strategy attracts responses about 30 – 59 %
√ denotes there is evidence for the strategy
0 denotes there is no evidence for the strategy
M denotes in learning the major subject content
E denotes in learning English

Appendix 9.3: PROBLEM-SOLVING – Results from all approaches

Problem-solving		Perceived Relevance												Use											
		Q'naire				Self reports				Think-aloud				Q'naire				Self reports				Think-aloud			
		ASci		CA		Asci		CA		Asci		CA		Asci		Cas		Asci		CA		Asci		CA	
		M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E
1.Revising the plan	**L**	+		+	+	0	0	0	0	0	0	0	0			+	+	0	0	0	0	0	0	0	0
	R					0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0
2.Accessing various resources	**L**					0	0	0	0	0	0	0	0	-				0	0	0	-	0	√	√	√
	R					0	0	0	-	0	0	0	0					-	0	-	-	0	√	0	√
3.Ignoring problems	**L**		-	-	-	0	0	0	0	0	0	0	0			-	-	-	-	0	-	0	√	√	√
	R					0	0	0	0	0	0	0	0					0	-	0	0	√	√	√	√
4.Asking for clarification	**L**				-	-	0	-	0	0	0	0	0				-	-	-	-	-	√	√	√	√
	R					-	0	0	0	0	0	0	0					-	0	-	-	√	√	√	√
5.Linking with prior knowledge	**L**	+		+	+	-	-	-	-	0	0	0	0			+		-	-	-	-	√	√	√	√
	R					0	-	0	-	0	0	0	0					0	-	0	-	0	√	0	√
6.Seeking peer support	**L**				+	0	0	-	-	0	0	0	0		+		+	-	-		-	√	√	√	√
	R					0	0	-	0	0	0	0	0					0	-	-	-	√	√	√	√
7.Trying alternatives	**L**	+		+		0	0	0	0	0	0	0	0			+		0	0	0	0	0	0	√	0
	R					0	0	0	0	0	0	0	0					-	0	0	-	√	0	√	0
8.Making (new) guesses	**L**					0	0	0	0	0	0	0	0					0	0	0	-	0	√	0	√
	R					0	0	0	0	0	0	0	0					0	0	0	0	0	√	0	√
9.Logic reasoning	**L**					0	0	0	0	0	0	0	0					0	0	0	0	0	0	√	0
	R					0	0	0	0	0	0	0	0					0	0	0	0	0	0	√	0
10.Self-encouragement	**L**	+	+	+	+	0	0	0	0	0	0	0	0			+	+	-	0	-	-	√	√	√	√
	R					0	0	0	0	0	0	0	0					-	0	-	-	√	√	√	√
11.Solving it alone	**L**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	-	0	√	0	√	0
	R					0	0	0	0	0	0	0	0					0	0	-	0	√	0	√	0
12.Effort directed	**L**	0	0	0	0	0	-	-	-	0	0	0	0	0	0	0	0	-	-	-	-	0	√	0	√
	R					-	-	-	-	0	0	0	0					-	-	-	-	0	√	0	√
13.Asking for help	**L**	0	0	0	0	-	0	-	-	0	0	0	0	0	0	0	0	-	-	-	-	√	√	√	√
	R					0	0	0	-	0	0	0	0					0	-	0	-	√	√	√	√
14.Extra reading	**L**	0	0	0	0	-	0		-	0	0	0	0	0	0	0	0	-	0		-	0	0	0	0
	R					0	0	-	-	0	0	0	0					-	0	-	-	0	0	0	0
15.Looking for solutions	**L**	0	0	0	0	-	-	-	-	0	0	0	0	0	0	0	0	-	0	-	0	0	0	√	0
	R					0	0	0	0	0	0	0	0					0	0	0	0	√	0	√	0
16.Adjusting methods/ techniques	**L**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	√	0	0	0
	R					0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0
17.Consulting the instructor	**L**	0	0	0	0	0	-	-	-	0	0	0	0	0	0	0	0	-	0	-	-	√	√	√	√
	R					0	-	-	-	0	0	0	0					0	-	-	-	0	√	0	√
18.Making revision	**L**	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	R					0	-	0	0	0	0	0	0					0	0	0	0	√	0	0	0
19.Discussing the problems	**L**	0	0	0	0	-	0	-	0	0	0	0	0	0	0	0	0	-	0	-	0	√	0	0	0
	R					0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0

Continues over

Appendix 9.3 – Continued

Problem-solving		Perceived Relevance												Use											
		Q'naire				Self reports				Think-aloud				Q'naire				Self reports				Think-aloud			
		ASci		CA		Asci		CA		Asci		CA		Asci		Cas		Asci		CA		Asci		CA	
		M	**E**	**M**	**E**	**M**	**E**	**M**	**E**	**M**	**E**	**M**	**E**	**M**	**E**	**M**	**E**	**M**	**E**	**M**	**E**	**M**	**E**	**M**	**E**
20.Concentration in class	**L**	**0**	**0**	**0**	**0**		**-**	**-**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**-**	**+**		**√**	**0**	**0**	**0**
	R					**-**	**-**	**-**	**-**	**0**	**0**	**0**	**0**					**-**	**-**	**-**	**-**	**0**	**0**	**0**	**0**
21.Trying to figure out main ideas	**L**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**		**-**	**0**	**0**	**0**	**0**
	R					**0**	**-**	**-**	**-**	**0**	**0**	**0**	**0**					**-**	**-**	**-**	**-**	**√**	**0**	**√**	**0**
22.Doing nothing	**L**	**0**	**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**	**-**	**-**	**0**	**0**	**0**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**0**	**-**	**0**	**-**	**0**	**0**	**0**	**0**
23.Suppressing distractions/ inappropriate thoughts	**L**	**0**	**0**	**0**	**0**		**0**	**-**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**	**-**	**-**	**0**	**0**	**0**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**-**	**0**	**-**	**-**	**√**	**0**	**√**	**0**
24.Reviewing the lessons/ notes	**L**	**0**	**0**	**0**	**0**	**-**	**-**	**-**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**		**-**	**√**	**0**	**0**	**0**
	R					**0**	**-**	**-**	**-**	**√**	**0**	**0**	**0**					**-**	**-**	**-**	**-**	**√**	**0**	**√**	**0**
25.Trying to resume concentration	**L**	**0**	**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**	**-**	**0**	**0**	**√**	**0**	**√**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**-**	**0**	**0**	**0**	**0**	**√**	**0**	**√**
26.Memorising words/informatio n	**L**	**0**	**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**0**	**-**	**-**	**0**	**0**	**0**	**0**
	R					**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**-**	**0**	**-**	**-**	**0**	**0**	**0**	**0**
27.Spending extra time to study/ practice	**L**	**0**	**0**	**0**	**0**	**-**	**-**	**-**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**	**-**	**-**	**0**	**0**	**0**	**0**
	R					**-**	**-**	**-**	**-**	**0**	**0**	**0**	**0**					**-**	**-**	**0**	**-**	**0**	**0**	**0**	**0**
28.Directing attention selectively	**L**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**	**0**	**-**	**√**	**0**	**0**	**0**
	R					**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**					**0**	**-**	**-**	**-**	**√**	**0**	**√**	**0**
29.Responding in class	**L**	**0**	**0**	**0**	**0**	**-**	**0**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**-**	**-**	**0**	**0**	**0**	**0**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
30.Making understanding clear	**L**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**	**-**	**-**	**√**	**0**	**0**	**0**
	R					**0**	**0**	**-**	**-**	**0**	**0**	**0**	**0**					**-**	**-**	**-**	**-**	**0**	**0**	**√**	**0**
31.Re-reading/ listening repeatedly	**L**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**0**	**0**	**-**	**0**	**√**	**0**	**√**
	R					**-**	**0**	**-**	**0**	**0**	**0**	**0**	**0**					**-**	**0**	**-**	**-**	**√**	**√**	**√**	**√**
32.Giving up	**L**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**	**0**	**-**	**0**	**√**	**0**	**√**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**0**	**-**	**0**	**-**	**0**	**√**	**√**	**√**
33.Working it out in a group	**L**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**√**	**√**	**√**	**√**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**√**	**√**	**√**	**√**
	R					**0**	**0**	**0**	**0**	**√**	**√**	**√**	**√**					**0**	**0**	**0**	**0**	**√**	**√**	**√**	**√**
34.Consulting a dictionary	**L**	**0**	**0**	**0**	**0**	**0**	**-**	**0**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**0**	**-**	**0**	**√**	**0**	**√**
	R					**0**	**-**	**0**	**-**	**0**	**√**	**0**	**√**					**0**	**-**	**0**	**+**	**0**	**√**	**0**	**√**
35.Keeping a vocabulary list	**L**	**0**	**0**	**0**	**0**	**0**	**-**	**0**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**
	R					**0**	**-**	**0**	**-**	**0**	**√**	**0**	**√**					**0**	**-**	**0**	**-**	**0**	**√**	**0**	**√**
36.Using context clues	**L**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**
37.Converting into L1	**L**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**0**	**√**	**0**	**√**	**0**	**0**	**0**	**0**	**0**	**-**	**0**	**-**	**0**	**√**	**0**	**√**
	R					**0**	**-**	**0**	**-**	**0**	**√**	**0**	**√**					**0**	**-**	**0**	**-**	**0**	**√**	**0**	**√**
38.Using hints/ body language	**L**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
39.Rehearsing	**L**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**0**	**-**	**0**	**√**	**0**	**√**
	R					**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**					**0**	**-**	**0**	**-**	**0**	**√**	**0**	**√**

- denotes the strategy attracts responses less than 30 %
+ denotes the strategy attracts responses higher than 60 %
(blank) denotes the strategy attracts responses about 30 – 59 %
√ denotes there is evidence for the strategy
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M denotes the MSC
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Appendix 9.4: EVALUATING STRATEGIES – Results from all approaches

Evaluating		Perceived Relevance												Use											
		Q'naire				Self reports				Think-aloud				Q'naire				Self reports				Think-aloud			
		ASci		CA		Asci		CA		Asci		CA		Asci		Cas		Asci		CA		Asci		CA	
		M	**E**	**M**	**E**	**M**	**E**	**M**	**E**	**M**	**E**	**M**	**E**	**M**	**E**	**M**	**E**	**M**	**E**	**M**	**E**	**M**	**E**	**M**	**E**
1.Judging that the goal has been met	L	+	+	+	+	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			+	+	**0**	**0**	**-**	**0**	**√**	**0**	**√**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**0**	**0**	**-**	**0**	**√**	**0**	**√**	**0**
2.Assessing strategy used	L			+	+	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			+	+	+				**√**	**0**	**√**	**√**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**-**	**-**	**-**		**√**	**0**	**√**	**√**
3.Within subject applicability	L					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			+		**-**	**0**	**-**	**-**	**√**	**0**	**0**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**0**	**0**	**-**	**0**	**0**	**0**	**0**	**0**
4.Other area applicability	L	+		+	+	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			+		**-**	**0**	**-**	**0**	**√**	**0**	**0**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**0**	**0**	**-**	**0**	**√**	**0**	**√**	**0**
5.Seeking other suitable strategy	L			+	+	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			+		**-**	**0**	**0**	**0**	**0**	**0**	**√**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**0**	**0**	**0**	**0**	**√**	**0**	**√**	**0**
6.Summarising ideas/lessons	L		+	+		**0**	**0**	**-**	**0**	**0**	**0**	**0**	**0**			+		**-**	**0**	**-**	**0**	**√**	**0**	**√**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**-**	**0**	**-**	**0**	**√**	**0**	**√**	**0**
7.Judging how much learned	L			+	+	**0**	**0**	**-**	**0**	**0**	**0**	**0**	**0**			+						**√**	**√**	**0**	**√**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**-**		**-**		**√**	**√**	**√**	**√**
8.Assessing correctness of the predictions/ answers	L					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**0**	**0**	**-**	**0**	**√**	**0**	**√**	**0**
9.Comparing new knowledge with known knowledge	L	+	+	+		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			+		**-**	**0**	**-**	**0**	**√**	**0**	**√**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**0**	**0**	**0**	**-**	**√**	**0**	**√**	**0**
10.Judging worthiness of learning	L	+	+	+	+	**0**	**0**	**-**	**0**	**0**	**0**	**0**	**0**	+		+	+	**-**	**-**	**-**	**-**	**√**	**0**	**√**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**0**	**-**	**-**	**-**	**0**	**0**	**√**	**0**
11.Assessing work/learning	L	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	+		+		**√**	**0**	**√**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**0**	**-**	**-**	**-**	**0**	**0**	**√**	**0**
12.Detecting failure/ weaknesses/ problems	L	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	+	+	+	+	**√**	**√**	**√**	**√**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**-**	+	**-**	+	**√**	**√**	**√**	**√**
13.Assessing knowledge/ information	L	**0**	**0**	**0**	**0**	**-**	**0**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**	**-**	**-**	**√**	**0**	**√**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**0**	**-**	**-**	**-**	**√**	**0**	**√**	**0**
14.Refining ideas/skills	L	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**	**-**	**0**	**√**	**0**	**√**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**0**	**-**	**-**	**0**	**√**	**0**	**√**	**0**
15.Self-assessment	L	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	+			+	**√**	**√**	**√**	**√**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**-**		**-**	+	**√**	**√**	**√**	**√**
16.Applying learning to practice	L	**0**	**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**0**	**-**	**0**	**0**	**0**	**0**	**0**
	R					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

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