
A Think-Aloud Protocol Of The Translation Process Of A Scientific Text From English to Malay

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Introduction

This study investigates the cognitive processes involved in the translation process of an English language scientific text, hereafter referred to as the source text, into the Malay language, hereafter referred to as the target text, via a think-aloud protocol (TAP). The subject for this study was a Malay lady lecturer from the Biochemistry Department, Faculty of Medicine, University of Malaya, who is also a part-time, experienced translator. The technique (TAP) involves asking the subject to think aloud or articulate everything that went on in her mind while she was translating. According to Dechert and Sandrock (1986: 115), the think-aloud protocol (TAP) method "allows particular analyses of the levels, steps, units of processing, the role and the interaction of the source and target languages, the amount of proceduralisation, the origin and course of search processes, and the times used for these processes." According to Hoffstaedter (1987: 76 in Toury 1991: 59), the analysis of the

TAP tells investigators “something relevant about the underlying processes.” The TAP was tape-recorded, transcribed and then analysed based on the direct and indirect language learning strategies taxonomy (see Appendix A) put forward by Oxford (1990). According to Oxford (1990: 8), the word “strategy” means a “plan, step or conscious action toward achievement of an objective.” The ‘direct strategies’ relate to the ways in which the learner (here, the translator) deals with the mental processing of the source and target languages during the translation process. The ‘indirect’ strategies involve the general management of the translation task. Oxford (1990: 151) stresses that indirect strategies are useful in virtually all language learning situations and are applicable to all the four basic language skills. These strategies have been proven to be highly reliable and valid and they have also been used for many language tasks such as, the instructional tool called “The Language Learning Disc” for independent learning by Joan Rubin, CALLA: the Cognitive Academic Language Learning Approach by Chamot and O’Malley, the CRAPEL Model for self-directed learning by the University of France etc. According to Oxford (1990: 11), other important features of language strategies are “problem orientation, action basis, involvement just beyond cognition, ability to support learning directly or indirectly, degree of observability, level of consciousness, teachability, flexibility and influences on strategy choice.” Oxford (1990: 1) argues that, “strategies are important because they are *tools* for active self-directed involvement, which is essential for developing communicative competence.” The researcher strongly feels that the language strategies are the *core tools* to realise the translation process as they help translators solve their problems while translating to accomplish a good translation product. The use of language strategies facilitates the translation task by making it easier and more effective. Oxford (1990: 8) stresses that, “Learning strategies are operations employed by the learner to aid the acquisition, storage, retrieval and use of information” In every stage of the translation process which involves nine major iterative activities – planning reading, information analysis, translating, revising, editing, proofreading and reviewing (Darwish 1999: 6), these language strategies help in enhancing the translation process.

The subject in this study was a graduate lecturer and thus, an advanced language learner. She obtained distinctions in English and Malay for her SPM examination and was a science specialist as she majored in Biochemistry and has been teaching in this field for the past 20 years. According to Robinson (1997: 94) the translator is always a learner and this is stated as:

translation for the professional translator is a constant learning cycle that moves through the stages of instinct, experience, and habit, and, within experience, through the stages of abduction (guesswork), induction (pattern-building), and deduction (rules, laws, theories); the translator is at once a professional for whom complex mental processes have become second nature (and thus subliminal), and a *learner* who must constantly face and solve new problems in conscious analytical ways.

Furthermore, Robinson explains the translation process as a process of learning and the translator, as a learner who is coping with new words and styles in his task of translating (1997: 49-51):

translation is intelligent activity involving complex processes of conscious and unconscious *learning*. translation is a highly complicated process requiring rapid multilayered analyses of semantic fields, syntactic structures, the sociology and psychology of reader ..and cultural difference. requiring creative *problem-solving* in novel textual, social and cultural conditions. This intelligent activity is sometimes very conscious; most of the time it is subconscious, 'beneath' our conscious awareness. The sublimated intelligence that makes it possible for us to translate rapidly, reliably and enjoyably is the *product of learning* – which is to say, of experience stored in memory in ways that enable its effective recall and flexible and versatile use. translators *learn* words and phrases, style and tones and registers, linguistic and cultural strategies while translating.

Therefore, the use of language learning strategies to analyse a translation task in this study is justified.

Definitions of Translation

Catford (1965: 1) sees translation as a text substitution process as he says translation is, "an operation performed on languages: a process of substituting a text in one language for a text in another." Another authority, Nida (1959: 19), defines translation as, "translating consists in producing in the receptor language the closest natural equivalent to the message of the source language, first in meaning and secondly in style." Like Nida (1959), Jumpelt (1961) and Wilss (1977) also emphasise dynamic equivalence and reader-oriented translation. For the purpose of this study, the researcher will use the definitions proposed by Nida (1959), Jumpelt (1961), Wilss (1977) and Bell

(1991) as their definitions have a strong relevance when it comes to the translation of scientific texts which emphasise equivalent terminology, reader orientation and the communication of meaning.

Nida's definition allows freedom for the concept of "dynamic equivalence" expounded in his *Toward a Science of Translating*, a concept appropriate to Nida's (1964: 166) objective of producing "the closest natural equivalent to the source language message", a rendering in which "the focus of attention is directed not so much toward the source message as toward receptor response." A comparable emphasis on reader reception is also apparent in the definition given by Jumpselt (1961:66) which is, "Translation is not a transfer of lexical forms or content but a reconstruction or recasting of the patterns in original texts." Like Nida (1959), Jumpselt (1961. 177) adheres to the reader-oriented "principle of similar effect." Although Jumpselt (1961) deals only with texts on technical or scientific subjects, his objective is also to provide renderings considered acceptable to target language readers, and so formulated as to have on the reader the same effect as a text with the same content written in the reader's native language. Noting that the style of texts on technical and scientific subjects often leaves much to be desired, Jumpselt (1961: 40) insists that "form defects' must be set right in target language renderings.

Another recent definition which is perhaps more indicative of the trend toward a systematic approach to translation is given by Wilss (1977: 72), which is as follows:

Translation is a phased process comprising two basic phases: an analysis phase in which the translator analyses the stylistic and semantic aspects of the source language text, and a reformation phase, in which the translator reproduces in the target language, with optimal implementation of the requirements of communicative equivalence, the stylistic and semantic aspects of the source language text.

Another important aspect of translation is to see translation as communication, and here Bell (1991. 20) defines translation as, the replacement of a representation of a text in one language by a representation of an equivalent text in a second language." According to Houbert (1998. 1), the translator, before being a "writer," is primarily a "message conveyor". Translation is a process whereby a message expressed in a specific source language is

linguistically transformed in order to be understood clearly and accurately by readers of the target language. To do this, the translator often needs to contact the writer of the original text to clarify the ambiguities he comes across in his reading.

Translation is also an interdisciplinary topic that cuts across many different fields such as sociolinguistics, psycholinguistics, ethnography, culture, beliefs etc. However, a scientific text is likely to be culture-independent to a very large extent, compared to other texts which are likely to be culture dependent. Differences between languages in areas such as tense, aspect, mood and voice are all likely to cause translation problems. It is important for a translator to be knowledgeable in both the source and target languages and in the subject matter that is being translated so that he or she will be able to relate concepts from the source culture to the target language culture. This is supported by Viaggio (1998: 2) who insists that translators have to be specialists in mediated interlingual/intercultural communication.

A translator's knowledge and her attempts to relate concepts from the source language to their equivalents in the target culture may be seen in the TAP in this study.

The Cognitive Processes in Translation

One of the fascinating psychological questions that remains to be solved in translation is this: What goes on in the translator's mind as he translates instantaneously and directly from one language to another? This entails a study of cognitive psychology, which is the study of the internal processes involved in cognitive tasks - the processes involved in making sense of the environment and interacting appropriately with it (Kurz: 1998: 1). These processes include attention, perception, learning, memory, language, concept formation, problem solving and thinking (Eysenck 1994 in Kurz 1998: 1). The aim is to provide an understanding of cognitive functioning, a look into the "black box" of the human mind. In spite of its diversity, cognitive psychology is unified by the information-processing approach (Kurz: 1998: 1). To study these underlying internal processes of the mind, the TAP technique was used for this study.

The syntactic, semantic and pragmatic processing of textual input and the transfer of the source text into the target text require various interactive domain-specific and procedural skills including linguistic, extralinguistic,

situational (sociocultural) and rhetorical/stylistic knowledge. Translators must possess a set of skills that enable them to develop a potential for recognising translation problems and to create ways and means of overcoming these problems, thereby building up an inventory of translation techniques which together amount to what is frequently referred to as "translation routine." (Wilss 1996). This TAP study shows that all these skills are needed by a translator.

Aims of the Study

The aims of the study are as follows:-

- a. to investigate whether the direct (memory, cognitive and compensation) and indirect (metacognitive, affective and social) language learning strategies put forward by Oxford (1990) were used during the translation process
- b. to identify the strategies that were used the most in the translation process
- c. to investigate the problems faced while translating and how they were overcome

Analysis and Discussion of Findings

The subject translated aloud an English language scientific text entitled, "Transport of Amino Acids into Cells" into the Malay language (refer to Appendix A, B and C). The think-aloud protocol (TAP) was tape-recorded and transcribed. She was also interviewed to investigate the difficulties she encountered in her translation process. The TAP was analysed based on the direct and indirect language strategies provided by Oxford (1990). From the analysis of the TAP (see Appendix C), it was seen that the main direct and indirect strategies were employed by the subject.

The Direct Strategies used by the subject in the TAP were as follows:

A. MEMORY STRATEGIES

The memory strategies that were used by the subject were creating mental linkages, applying images and sounds and reviewing well.

A. 1 Creating Mental Linkages

In this set, the two strategies that were used were associating and elaborating.

A.1.1 Associating. The subject displayed the ability to associate terms and to choose the most appropriate equivalent terms in the target language. This strategy was seen in finding terms in Malay, for example, transport is *pengangkutan*, significantly lower is *lebih rendah*, gradient is *kecerunan*, using the Malay word *pada* instead of *dalam* to mean the process that occurred “at the kidney.” For the phrase, “one transport system is nnnnresponsible for,” she understood “reponsible” to mean “role” and not a “responsible man” and came up with the appropriate translation equivalent, *berperanan* which suited the context of the situation.

A.1.2 Elaborating. Here she explained that ‘cystinuria’ means ‘a lot of cystin’, that is, a lot of amino acids in the urine which cannot be absorbed and thus flow out in the urine. Further, for better understanding the source text, she elaborated on the cause of the blockage, suggesting that normally stones are found in the kidney and come down the tract and block the flow of the urine.

A.2 Applying Images and Sounds

In this only one strategy, that is imagery was used.

A.2.1 Using imagery. “Stones” were translated as *karang* because the subject was able to visualise the stones as corals as she had actually seen them. Their texture is not smooth and their shape is like coral and this is very familiar to the Malays and their culture.

A.3 Reviewing well

This category contains just one strategy, structured reviewing. Looking at new target language information once is not enough; it must be reviewed in order to be remembered.

A.3.1 Structured Reviewing. The subject translated a sentence in the target language and reviewed it against the source language sentence to ensure that the meaning that was communicated was accurate and deliv-

ered in correct, grammatical target language. She did this for almost all the sentences that she translated into the target language.

B. COGNITIVE STRATEGIES

The four sets of cognitive strategies that were used by the subject in this study were practicing, receiving and sending messages, analysing and reasoning and creating structure for input and output.

B.1 Practising

Only one strategy, which is repeating was used under this set.

B. 1.1 Repeating

The subject repeated the translated sentence in the target language to hear how it sounded and then checked it against the original source language sentence.

B. 2 Receiving and sending messages

One strategy was used from this set and it was getting the idea quickly.

B. 2.1 Getting the idea quickly Here the subject first skimmed the whole passage, then scanned each sentence and summarised the idea in the source language. For example, she said, "this means that the concentration in extra-cellular cells is lower than in body."

B. 3 Analysing and reasoning

This set comprises five strategies which are, reasoning deductively, analysing expressions, analysing contrastively, translating and transferring. All these strategies were used collectively in the translation process.

This is the strategy that is most frequently used while translating. For example, the subject read the source text sentence, then divided it into chunks and proceeded with the translation. Sometimes, when the source language sentences were too long, she analysed the difficult expressions first, for example, "overlapping specificity", "responsible", "most common genetic error" etc. and analysed them contrastively to come up with equivalent terms that can best convey the meaning in Malay. She frequently paraphrased, for example, "inherited disorder" may be

translated as *penyakit warisan* or *gangguan terwaris*. The latter is a direct translation which the readers may not understand, so she used the term *penyakit warisan*, a term which was simpler for the target readers, that is the university students. Urinary tract could be translated as *trak* or *saluran urinari*. The term “urinary” refers to the whole system, that is, the urether and bladder. Throughout the translation, she reasoned, analysed and transferred the concepts into the target culture and translated them in as effective a manner as possible to ensure easy understanding by the target readers.

B.4 Creating structure for input and output

This set comprises two strategies which are summarising and highlighting.

B.4.1 Summarising. She read the source text and summarised it as follows, “The main content of this passage is the transport of amino acids into cells.”

B.4.2 Highlighting: She translated the title, highlighted it as well as the name of a disease, for example, *sistinuria* in her translation so that students were made aware of these important details in their reading of the translated text.

C. COMPENSATION STRATEGIES

The subject used two strategies under this set. These are guessing intelligently by using linguistic clues and overcoming limitations in speaking and writing. These were used to overcome an inadequate repertoire of grammar, especially, of vocabulary.

C.1. Guessing intelligently by using linguistic clues. The word ‘space’ was translated as *ruang*, “responsible” as *berperanan*, “umum” as *lazim*. The equivalents chosen in the target language were based on the context of situation of the passage.

C.2. Overcoming limitations in speaking and writing. Here the translator used a synonym. For example ‘defective’ was translated as *rosak*, ‘stones’ as *karang*, the word “in” was translated as *pada* for the sentence... “for reabsorption in kidney tubules of the amino acids. ”

in the target language. Here the translator arrived at the meaning by means of circumlocution.

The Indirect Strategies used were the metacognitive, affective and social strategies.

A. METACOGNITIVE STRATEGIES

According to Oxford (1990: 136), "Metacognitive means beyond, beside, or with the cognitive." Two strategy sets, arranging and planning and evaluating were used by the subject in this study. Please see Appendix C for TAP analysis.

- A.1 Arranging and planning:** This is seen when the subject planned and made decisions on how to go about translating, for example, she said, "First I'll read the source text, then I'll type everything in the computer. Now I'll read the first sentence, now I'll translate." After completing the translation of the first sentence, she said, 'now I'll go on to the next.' She made and implemented her decisions.
- A.2 Evaluating.** This set included strategies like self-monitoring and self-evaluating. Here the subject monitored her own translation and reviewed it and improved on it as she went along.

B. AFFECTIVE STRATEGIES

According to Oxford (1990: 140) "*affective* refers to emotions, attitudes, motivations and values." The strategies used under this set included lowering your anxiety and taking your emotional temperature.

- B.1. Lowering your anxiety.** For example, in translating the phrase "overlapping specificity," she talked to herself and sometimes laughed softly, saying that it was difficult and thought on how best she could convey the meaning of this term in the target language. She actually meditated on this phrase for some time.
- B. 2. Taking your emotional temperature.** At one point the translator discussed her feelings with the researcher when she said, "As I read in

Malay, my brain thinks in English.” Further on, she said, “ I can translate immediately in my brain.”

C. SOCIAL STRATEGIES

According to Oxford (1990: 144), “language is a form of social behaviour; it is communication, and communication occurs between and among people. Under this set, one strategy, which was empathising with others was used.

- C. 1. **Empathising with others.** To show empathy for the target readers in her translation process, two strategies that is, developing cultural understanding and becoming aware of the thoughts and feelings of others were used. Here she used the term *penyakit warisan* instead of *gangguan terwaris* to ensure that the students do not get confused. She resorted to using simpler equivalent terms and the target language used was kept at a suitable level of proficiency to ensure that the target readers would understand her translation.

The implication from this finding is that language learning strategies should be taught to all trainee translators in all translator training institutions so that they will be aware of such strategies as these strategies enhance the translation task. Findings from past studies determining the effects of strategy training on different kinds of tasks and learners, generally indicate that strategy training is effective in improving the performance of students on a wide range of reading comprehension and problem-solving tasks (e.g. Brown et al. 1983, Chipman, Segal and Glaser 1985; Dansereau 1985, Segal, Chipman and Glaser 1985 In O'Malley 1990: 7-8).

Analysis of the Strategies used in the Translation Process

The subject used a total of 69 times the language learning strategies in her translation task. The breakdown of each strategy used is given in Table 1.

Table 1: The Number and Percentages Of Direct And Indirect Strategies Used

Strategies	Direct Strategies			Indirect Strategies			Total
	Memory	Cognitive	Compensation	Metacog.	Affective	Social	
Subject							
Biochemistry lecturer	7 10.14%	38 55.07%	2 2.90%	16 23.19%	4 5.80%	2 2.90%	69 100%

The Most Used Strategies in the Translation Process

From the above table, it can be seen that the subject used the cognitive strategies the most (55.07%). The second most used strategies were the metacognitive strategies (23.19%) followed by the memory strategies (10.14%), affective strategies (5.80%), social strategies (2.90%) and compensation strategies, (2.90%). This findings supports O'Malley's (1990: 1) view which is:

In cognitive theory, individuals are said to 'process' information, and the thoughts involved in this cognitive activity are referred to as 'mental processes'. Learning strategies are special ways of processing information that enhance comprehension, learning, or retention of information.

According to Darwish (1999: 24), "the internal translation process is in fact the cognitive process that takes place during the act of translating." To realise the cognitive process, the most important tools are the cognitive strategies and the findings from this study proved this.

The second most used strategies in the subject's translation process were the metacognitive strategies because it involved making decisions on how to manage the translation task such as, making decisions on planning and organising, monitoring and reviewing the translation process and evaluating her performance in the translation task. In other words, it involved making and implementing the decisions made. According to Darwish (1999: 3), data derived from empirical research pioneered by Jumpelt (1961), Levy (1967), Toury (1985, 1995), Seguinot (1991), Wilss (1994) and Lorsch (1995) and other researchers have "highlighted the significance of decision making as the backbone of translation." According to Darwish (1993: 3):

“there is now general agreement among translation researchers, educators and practitioners that decision-making plays an important part in both the translator’s performance and the quality of the translation product”

For a language task like translation to be successful, one needs a pairing of cognitive and metacognitive strategies. According to Brown et al. (in O’Malley 1990: 8), research in metacognitive and cognitive learning strategies suggests that transfer of strategy training to new tasks (here, translation tasks) can be maximised by pairing metacognitive strategies with appropriate cognitive strategies. These two strategies were the most used in the TAP and the subject was able to produce a good translation product.

The Difficulties Faced During The Translation Process and How These Were Overcome

From an interview conducted immediately after the TAP, the subject told the researcher that the first problem faced while translating was when she discovered that the facts presented in the source language scientific text were not clear and she said, “In this source-text paragraph, the facts are not well-defined and it needs editing. For example, in sentence two it should be made clear that the gradient is maintained because of the existence of active transport systems which cause movement and if there is no active transport, then there is no gradient. In the fourth sentence of the source text which reads... “One transport system. ...” should be made clearer and rephrased as “One of the transport systems...(Nor Azila, 2000).” To overcome such problems she said, “ I often write to the original author to correct the facts and they often thank me for pointing out facts. In my translation, I correct all these discrepancies.(Nor Azila, 2000).”

The second difficulty faced by the subject had to do with difficult expressions in the source text and of finding appropriate matching equivalent terms in the target language for words like *overlapping specificity*, *responsible*, the use of the preposition “in”, *inherited disorder*, *most common genetic error* and *stones*. These were problems because there were no one-to-one equivalents in the target language and the subject had to think of presenting equivalent terms that suited the context of the situation and the culture of the target readers. To solve this problem of terminology, the subject used her intelligence and memory to analyse the difficult words and then she paraphrased the meaning of the difficult expressions in the source language

and sometimes she used more words in the transfer into the target language so that the target readers – here, the university students would be able to understand the translated version. As an example, for the word “responsible”, she clarified what this meant in the ordinary sense, but for the purpose of the translation task, she showed her prowess as a skilled, experienced translator when she chose the Malay word *berperanan* instead of *bertanggungjawab* (meaning *responsible* in the general sense) as this appeared more appropriate in the context of the situation in the scientific text. As a native Malay speaker, her accurate intuitiveness for the Malay language enabled her to choose the appropriate equivalent word in her translation. For the word “stones” she did not translate these literally as *batu*. Using the memory strategy of imaging, the subject chose the most vivid equivalent term *karang* (corals) to substitute the word “stones” for the source language scientific text as she knew and had seen kidney stones before. Here, she followed Nida’s concept of “dynamic equivalence” of producing the “closest natural equivalent to the source language message”, a rendering in which “the focus of attention is directed not so much toward the source message as toward receptor response.” (1964. 166). She ensured that her translated version would not sound funny when read by target readers of the translated version, so she was careful of the Malay language used to present the meaning of the original text. Similarly, for the preposition “in”, she chose the equivalent term *pada*, because in this context, she clarified “ we are talking about the process *at* the kidney and not *in* the kidney (Nor Azila: 2000).” Here, she showed that she was a subject specialist. A characteristic of a good translator, besides being good in the two languages used in the translation task, is to be good in the subject area as well. This importance has been emphasised by Aiono Muhammad (1979: 12) who stated that a translator has to be good in the source language, even better in the target language, must be a subject specialist and must have the knowledge of the theoretical and practical side of translation. For the phrase “inherited disorder” the translator first voiced out the possibilities of the equivalent terms that is *penyakit warisan* or *gangguan terwaris* (this is a literal translation). The subject eventually selected the term *penyakit warisan* because it would be simpler for the target readers to understand. For the phrase “most common genetic error,” she translated this as *ralat genetik yang paling lazim* – after reasoning that the word “common” should not be translated as *umum* which carries the meaning of “general” but rather *lazim* which means “common” and so is more appropriate in this context. Here she always kept the *skopos* or aim of the translation in her mind. The term *skopos* means end, aim or purpose. According to Mohamad Didaoui (1995. 3), translation is effected by the

purpose and situation and the end-user focus in translation is considered primordial.

Conclusion

All the principal direct and indirect language learning strategies by Oxford (1990) were used in the translation process of the English language scientific text into the Malay language in this study. The most used strategies were the cognitive and metacognitive strategies. The implication of this finding is that all translators should be made aware of the importance of using these strategies as translation tools while translating a text from any source language into a target language.

The main problems faced by the subject were ambiguities in the original text and in finding matching equivalent terms in the target language. However, these problems can be resolved by taking the initiative to write to the original writer for clarification and also by using one's correct intuitiveness and knowledge of the target language to come up with the closest natural equivalents in the target language that suit the context of the situation and the culture of the target readers.

Finally, the meaning of the scientific text in the source language must be communicated accurately and naturally at a suitable level of proficiency in the target language by translators so that the target readers will be able to understand the translated text easily.

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APPENDIX A

DIRECT STRATEGIES	INDIRECT STRATEGIES
<p>1. Memory strategies</p> <ul style="list-style-type: none"> • Creating mental linkage (e.g. grouping, associating, elaborating) • Applying images and sound (e.g. using imagery, semantic mapping) • Reviewing well (structured reviewing) • Employing action (e.g. using physical response or sensation) <p>2. Cognitive strategies</p> <ul style="list-style-type: none"> • Practising (repeating, formally practicing with sounds and writing systems, recognising and using formulas and patterns, recombining and practicing naturalistically. • Receiving and sending messages (getting the idea quickly, using resources for receiving and sending messages.) • Analysing and reasoning (reasoning deductively, analysing expressions, analysing contrastively (across languages), translating, transferring) • Creating structure for input and output (taking notes, summarising, highlighting) <p>3. Compensation strategies</p> <ul style="list-style-type: none"> • Guessing intelligently (using linguistic clues, using other clues) • Overcoming limitations in speaking and writing (switching to the mother tongue, getting help, using mime or gesture, avoiding communication partially or totally, selecting the topic, adjusting or approximating the message, coining words, using a circumlocution or synonym) 	<p>1. Metacognitive strategies</p> <ul style="list-style-type: none"> • Centering your learning (overviewing and linking with already known material, paying attention, delaying speech production to focus on listening) • Arranging and planning (finding about language, organising, setting goals and objectives, identifying the purpose of a language task, planning for a language task, seeking practise opportunities) • Evaluating (self-monitoring, self-evaluating) <p>2. Affective strategies</p> <ul style="list-style-type: none"> • Lowering your anxiety (using progressive relaxation, deep breathing or mediatation, using music, using laughter) • Encouraging yourself (making positive statements, taking risks) • Taking your emotional temperature listening to your body, using a checklist, writing a language learning diary, discussing your feelings with someone else) <p>3. Social strategies</p> <ul style="list-style-type: none"> • Asking questions (asking for clarification or verification, asking for correction) • Cooperating with orthers (cooperating with peers, cooperating with proficient users of the language) • Empathising with others (developing cultural understanding, becoming aware of others thought and feeling)

SOURCE: Oxford (1990), *Language Learning Strategies – What Every Teacher Should Know*. New York · Newbury House Publishers

APPENDIX B

Translation versus Original

Source Text in English (Excerpt taken from <u>Biochemistry - Second Edition</u> 1994. Pamela C. Chause and Richard A. Harvey U.S.A : J.B. Lippincott Co.) Final translated version in Malay	Final Translated version in Malay
<p><u>Transport of Amino Acids into Cells</u></p> <p>The concentration of free amino acids in the extracellular fluids is significantly lower than that within the cells of the body. This concentration gradient is maintained because active transport systems, driven by the hydrolysis of ATP are required for movement of amino acids from the extra cellular space into cells. At least seven different transport systems are known that have overlapping specificity for different amino acids. One transport system is responsible for re-absorption in kidney tubules of the amino acids cysteine, ornithine, arginine and lysine. In the inherited disorder cystinuria, this carrier system is defective, resulting in the appearance of all four amino acids in the urine. Cystinuria occurs at a frequency of 1 in 7000 individuals, making it one of the most common inherited diseases and the most common genetic error of amino acid transport. The disease expresses itself clinically by the precipitation of cystine to form kidney stones (calculi), which can block the urinary tract.</p>	<p><u>Pengangkutan asid amino ke dalam sel</u></p> <p>Kepekatan asid amino bebas di dalam cecair luar sel adalah lebih rendah daripada kepekataannya di dalam sel tubuh. Cerun kepekataannya dikekalkan kerana sistem pengangkutan aktif yang didorong oleh hidrolisis ATP, digunakan untuk pergerakan asid amino dari ruang di luar sel ke dalam sel. Sekurang-kurangnya tujuh sistem pengangkutan yang berlainan diketahui yang mempunyai kekhususan yang bertindihan untuk asid amino yang berlainan. Salah satu daripada sistem pengangkutan tersebut berperanan untuk menyerap semula asid amino, sisteina, ornitina, arginina dan lisina pada tubul ginjal. Dalam penyakit warisan sistinuria, sistem pengangkut ini rosak yang mengakibatkan ke-empat-empat asid amino muncul di dalam air kencing. Sistinuria berlaku pada kekerapan sebanyak 1 dalam 7000 individu, yang menjadikannya salah satu penyakit warisan yang lazim ditemui dan ralat genetik yang paling lazim berlaku untuk pengangkutan asid amino. Secara klinikal, penyakit ini menjadi ketara melalui pendedahan sistina sebagai karang ginjal (kalkulus) yang mungkin menyumbat saluran urinari.</p>

APPENDIX C

Excerpt of Think-aloud Protocol (TAP)

Think-aloud protocol transcribed	Memory (M), Cognitive (CS), Compensation ©, Metacognitive (MS), Affective (AS) and Social (SS) Strategies used in the process of translation
<p>First I'll read the text (reads text to herself loudly). The main content of this paragraph is transport of amino acids into cells. Now, I'll type everything into the computer. Transport is <i>pengangkutan</i> so,</p> <p>Pengangkutan asid amino ke dalam sel That being the title I've made it bold. Now I go to the main text (reads the first sentence - The concentration of free amino acids in the extracellular fluids is significantly lower than that within the cells of the body). This means that the concentration in extra-cellular cells is lower than in body. Concentration is <i>kepekatan</i>, so: <i>Kepekatan asid amino di dalam cecair luar sel adalah</i> (significantly lower is <i>lebih rendah</i>) <i>lebih rendah daripada kepekatan di dalam sel tubuh</i>. Let me read the sentence in the text again and now I'll read the translated version (reads and is satisfied). Now, the next sentence (reads it - The concentration gradient is maintained because active transport systems driven by the hydrolysis of ATP are required for movement of amino acids from the extra cellular space into cells) Gradient is <i>kecerunan</i> so:</p>	<p>Arranging and planning (MS) – making decisions Creating structure for input and output – summarising. (CS) Creating mental linkages (M) Analysing and reasoning - translating (CS)</p> <p>Highlighting (CS) Planning (MS)- making decisions</p> <p>Receiving and sending messages – getting the idea quickly. (CS). Creating mental linkages (M)</p> <p>Analysing and reasoning - translating, (CS) Creating mental linkages (M) Reviewing well (M) Encouraging yourself (AS) Arranging and planning (MS)</p> <p>Creating mental linkages (M)</p> <p>Analysing and reasoning - Translation (CS)</p>

<p><i>Cerun kepekatannya dkekalkan kerana sistem pengangkutan aktif, yang didorong oleh hidrolisis ATP, digunakan untuk pergerakan asid amino dari cecair (let me read in English again, it's space, so ruang not cecair) dari ruang di luar sel ke dalam sel. (reads English sentence again and then reads the Malay sentence and is satisfied with the translation). Now to the next sentence (reads - At least seven different transport systems are known that have overlapping specificity for different amino acids). Overlapping specificity, that's a difficult one, that means the same one may carry more than one type of amino acids. At least is <i>sekurang-kurang</i> so: <i>Sekurang-kurangnya tujuh sistem pengangkutan yang berlainan diketahui yang mempunyai kekhususan yang bertindihan untuk asid amino yang berlainan. As I read in Malay, my brain thinks in English. Now, the next statement (reads in English" One transport system is responsible for reabsorption in kidney tubules of the amino acids cysteine, ornithine, arginine and lysine."I can translate immediately in my brain.</i></i></p>	<p>Guessing intelligently ©</p> <p>Encouraging yourself (AS)</p> <p>Planning (MS)</p> <p>Lowering your anxiety - self-talk (AS)</p> <p>Analysing and reasoning - analysing expressions (CS)</p> <p>Creating mental linkages (M)</p> <p>Analysing and reasoning - translating (CS).</p> <p>Taking your emotional temperature – discussing your feelings with someone else while smiling (AS).</p> <p>Arranging and planning (MS)</p> <p>Taking your emotional temperatu re-discussing your feelings with someone else. (AS)</p>
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APPENDIX D

INTERVIEW QUESTIONS

1. Where did you do your training as a translator?
2. Did you learn all about the theories and processes of translation?
3. Do you consider yourself a subject and language specialist?
4. How many Science books have you translated? Please name them.
5. How long did it take you to translate a book?
6. How many years have you been translating Science texts from English into Malay?
7. Have you been acknowledged in the translated text? If yes, how?
8. How did you go about translating the text? Could you please let me know the processes?
9. How long does it take you to translate a page?
10. What are the materials that you need with you in order to translate?
11. Was there anything that you needed but did not have with you in your translation process?
12. Are you given deadlines to complete your translation? Was there any delay in your translation? If so, what was the cause?
13. Who published your book?
14. How were you paid? Were you happy with the payment? Are you getting royalty for the sale of the translated version?
15. What were the problems and difficulties you faced when translating?
16. Was it done on a part-time or full-time basis?
17. How did you overcome the problems and difficulties?
18. In your opinion, was your translation perfect?
19. Was there any editing done on your translation? If yes, who did it?
20. Up till now, how many of your translated books have been published?
21. What are your recommendations through experience for good and speedy translation of Science and Technology texts?
22. As a conclusion, would you like to say anything else on the field of translation?