ANAFFECTIVE SELF-REGULATED(ASR) TUTORINGFRAMEWORK

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DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged.

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ABSTRACT

This thesis proposes an affective self-regulated tutoring (ASR) framework. This framework is underpinned by the emotion regulation theories. In the context of tutoring system, two stages of the students' self-regulation mechanism should be involved; at the outset and during a tutoring session itself. However, current affective tutoring framework regulates students' emotions only during the lesson; although it may happen several times during the lesson. To bridge the gap, a two level appraisal (primary and secondary) of tutoring framework is proposed. While the primary appraisal is proposed to be conducted at the outset of tutoring session, the secondary appraisal is during or after the lesson is completed.Moreover, unlike the current affective tutoring frameworks, which concentrate on the use of Problem-Focused Strategy, the ASR framework emphasizes on the use of Emotion-Focused Strategy to regulate students' emotional state during a tutoring session. Two emotion-focused strategies (i.e. *Relaxation Exercise* and *Doa* strategies) have been identified, integrated and tested within a working ASR system. Findings from this study have provided the evidence that students who were presented with the emotion-focused strategies (i.e. *Relaxation Exercise* and *Doa*groups) performed better than the control group (without emotion-focused strategies). Likewise, the students who were presented with the emotion-focused strategies were observed to have better improvement of their regulated emotional states (positive and negative emotions) at two learning stages; during and by the end of the tutoring session.

ABSTRAK

Tesis ini mencadangkan sebuah Rangka Kerja Tutoran Afektif Regulasi-Kendiri. Rangka kerja ini adalah didasari oleh teori-teori Regulasi Emosi (*emotion regulation theories*). Di dalam konteks sistem tutoran, terdapat dua fasa regulasi-kendiri pelajar yang sepatutnya terlibat; Sebelum and Sesama sesi tutoran.Namun begitu, rangka kerja Tutoran Regulasi-Kendiri semasa hanya meregulasi emosi pelajar semasa sesi tutoran sahaja, walaupun ia mungkin berlaku beberapa kali. Untuk menampung perbezaan ini, sebuah rangka kerja Tutoran Regulasi-Kendiri yang mempuyai proses penilaian dua fasa (primer dan sekunder) adalah dicadangkan. Sementara penilaian primeryang dicadangkan dilakukan pada*permulaan* sesi tutoran, penilaian kedua (sekunder) sepatutnya dilakukan *semasa* atau *selepas* tutoran selesai. Selain itu, berbeza dengan rangka kerja semasa yang lebih tertumpu kepada Strategi Berlandaskan Masalah (*Problem-Focused Strategy*), rangka kerja ini memberi tumpuan kepada penggunaan Strategi Berlandaskan Emosi (*Emotion-Focused Strategy*) untuk meregulasi emosi pelajar semasa sesi tutoran. Dua Strategi Berlandaskan Emosi (Senaman Berehat dan Doa) telah dikenalpasti, diintegrasi dan diuji keberkesanannya di dalam Sistem rangka kerja Afektif Reguluasi-kendiri ini. Rumusan daripada experimentasi telah membuktikan bahawa kumpulan pelajar yang menggunakan Strategi Berlandaskan Emosi menunjukkan prestasi pembelajaran yang lebih baik daripada kumpulan kawalan (tidak menggunakan Strategi Berlandaskan Emosi). Malahan, pelajar yang menggunakan Strategi Berlandaskan Emosi (kumpulan experimentasi) ini juga telah diperhatikan menunjukkan peningkatan didalam keupayaan untuk meregulasi-kendiri yang lebih baik pada dua fasa pembelajaran; semasa dan di akhir sesi tutoran.

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LIST OF ABBREVIATIONS AND ACRONYMS

ANOVA	One Way Analysis of Variance
ATS	Affective Tutoring System
ASR	Affective Self-Regulated
ITS	Intelligent Tutoring System
ILE	Intelligent Learning Environment
MACES	Multi Agent Architecture for a Collaborative Educational System
OCC	Ortony, Clore and Collins
PANAS	Positive and Negative Affect Schedule
WCQ	Ways of Coping Questionnaire

CHAPTER 1

OVERVIEW

1.1 INTRODUCTION

Attempts have been made to develop computer frameworks with the ability to recognise and express emotions (Picard 2007; Broekens et al. 2008; du Boulay et al. 2010). These frameworks are mainly derived from emotion theories (Ortony 2003; Gross et al. 2011) and the research area is often referred to as affective computing(Picard 2010). The aims of affective computing include giving a computer the ability to recognize, regulate and utilise emotions, and respond intelligently to human emotions (Ahn & Picard 2006;Kapoor et al. 2007;Picard 2010; D'Mello & Grasser 2011).

Within educational context, many studies on the relationship between learners' emotions and computer based tutoring systems especially within the intelligent tutoring system and intelligent learning environment (ILE) domains have been recorded (du Boulay et al.2010; D'Mello &Graesser 2011). According to the researchers, modeling learners' emotions can help anITS systemto recognize and regulate learners' emotional state with appropriate affectiveactions. This,in turn, would improve the quality of learning interactions which eventually leads to better learning performance.

Recently, more empirical evidencesto recognize the importance of emotions in learning has been published (Gross et al.2011; Pekrun& Stephens 2012). Emotions are strongly considered as one of the important factors underpinning success in learning (Van der Meij 2008;Pekrun 2011). There is evidence that positive emotions (i.e. feeling secure, happy and satisfied) facilitate students to perform better in learning

(Bandura 2011; Gross et al.2011, Wilson et al. 2012).However, uncontrolled negative or positive emotions can hinder students'learning activities. For example, negative emotions (e.g. fear and frustration) reduce a student's problem-solving ability (Bandura 2011; Grosset al. 2011; Wilson et al. 2012). Likewise, overly intense positive emotions make students to work carelessly or rather quickly (Efklies & Petkaki 2005;Pekrun 2011;Bandura 2011).

Therefore, it is important to regulate and control emotions to some degree during a learning episode (Bandura 2011;Gross et al. 2011). According toMayor et al. (2012), the regulation process involves three important skills:- the recognition, the regulation and the adaptation of one's emotional state. The improvement of such skills can create a better learning environment and improve students' performance (Pekrun 2010; Bandura 2011; Gross et al. 2011).

This thesis proposes the development of an affective self-regulated (ASR) framework for tutoring system and the use of two emotion–focused regulation strategies (i.e. the *RelaxationExercises* and *Doa*) in regulating students' emotional state within a controlled learning environment is explored. These emotion-focused regulation strategies are integrated into the affective self-regulated (ASR) tutoring framework. The development of the ASR framework is underpinning by emotion regulation theories (Lazarus 1991; Gross, 2011; Bandura 2011). The author argues that the deployment of the emotion–focused regulation strategies within the ASR framework contributes to the better quality of human computer interactions.

Emotions are important to students' performance (Goetz et al. 2008; Pekrun 2011), but the students' performance itself can also influence students' emotions (Ortony 2003; Bandura 2011), thus implying that emotion and student's performance are interrelated by reciprocal causation (Efklides & Volet 2005; Schutz & Pekrun 2007; D'Mello &Graesser 2011;). For instance, students' enjoyment and enthusiasm can improve students' effort and degree of focus thus leading to a better performance. Likewise, failure in an exam may reduce students' self-confidence and result in lower effort in learning.

Therefore, the authorbelieves that it is very important to define the direction of this thesis in relation to the causal link between emotions and students' performance at the outset of this thesis. Whilst the author acknowledges that students' emotions are likely be influenced by their performance, the direction of this work is on the effectof students' emotional state enhancementthrough the use of emotion-focused strategies (i.e. the *Relaxation Exercises* and *Doa*) towards students' performance and not vice-versa.

1.2 PROBLEM STATEMENT

Picard (2010) asserted that the adaptation of the emotional intelligence concept into an affective computing framework may improve the quality of human-computer interactions. She proposed that an affective computing framework should include the ability to recognise, regulate and utilise users' affective states. This is in accordance with the emotion regulation process (Lazarus 1991). Within the ILE community, an affective tutoring system framework usually consists of two components: the appraisal or recognition of the user's affective state, and the reaction or response to the user's affective state (D'Mello &Graesser 2012; du Boulay et al. 2010).

However, current ILE affective approachestypically do not conform to the complete emotion regulation process, which has two phases of appraisal and reaction, process (Lazarus 1991;Gross et al. 2011). The first appraisal and reaction phase takes place before the potentially affective situation has fully activated while the second regulation process takes place after the potentially affective situation has been activated. In contrast, current ILE frameworks often have only one appraisal and reaction phase which is conducted during a lesson (du Boulay et al.2010; D'Mello &Graesser 2012). Moreover, it is still an open question of the most efficient affective ILE framework adapting to user's affective states.

In addition, individuals use two kinds of strategy for regulating their emotional states; namely the emotion-focused and problem-focused strategies (Lazarus 1991; Bandura 2011; Gross et al. 2011). There is evidence from across a wide research spectrum that the use of both strategies helps to regulate individuals' affective states

(Schutz & Pekrun 2011; D'Mello &Graesser 2012). Moreover, there is evidence that incorporating both kinds of strategy improves students' academic achievement. (Linnenbrink 2006; Schutz & Pekrun 2011;Wilson et al. 2012).

By contrast, mostaffective tutoring frameworks largely depend on the use of problem-focused strategies such as providing examples and hints, for regulating students' affective states. An affective self-regulated(ASR) tutoring framework therefore, should incorporate both types'of regulation strategies to increase the effectiveness of framework and to fully optimize student's learning potential.

1.3 AIMS AND OBJECTIVES OF THE RESEARCH

The aims and objectives of this thesis are threefolds:

a) To explore, model and develop the components of anaffectiveself-regulated (ASR) tutoring framework based on emotion regulation theories.
b) To identify and develop suitable emotions-focused strategies within the affective self-regulated (ASR) tutoringframework.
c) To validate the outcomesof the framework, in particular, the benefit of the inclusion of theemotion-focused strategies in the framework.

1.4 SCOPE

The scope of the thesis covers the modeling and development of an affective self-regulated (ASR) tutoring framework which is underpinned by the emotion regulation theories. This includes the formulation of students-computer interactions andthe consequent stateof emotions as the result of their activities. The research has also exploredand identified two suitable emotion-focused strategies to be deployed within the ASR tutoring framework. The first strategy is *Relaxation Exercises* and the second strategy is *Doa*.

Furthermore, the proposed affective self-regulated (ASR) framework which integrates the emotions-focused strategies has been developed and implemented as a tutoring system. The tutoring system coversthe *function* chapter of C programing subject of UNITEN's degree program. Using a randomized pre-posttest quasi-experimental designand SPSS version 16, the effectiveness of the proposed framework and its emotion-focused strategies were tested and analyzed.

1.5 RESEARCH FRAMEWORK

In general, the research framework of this study can be classified into seven different stages as in Figure 1.1.

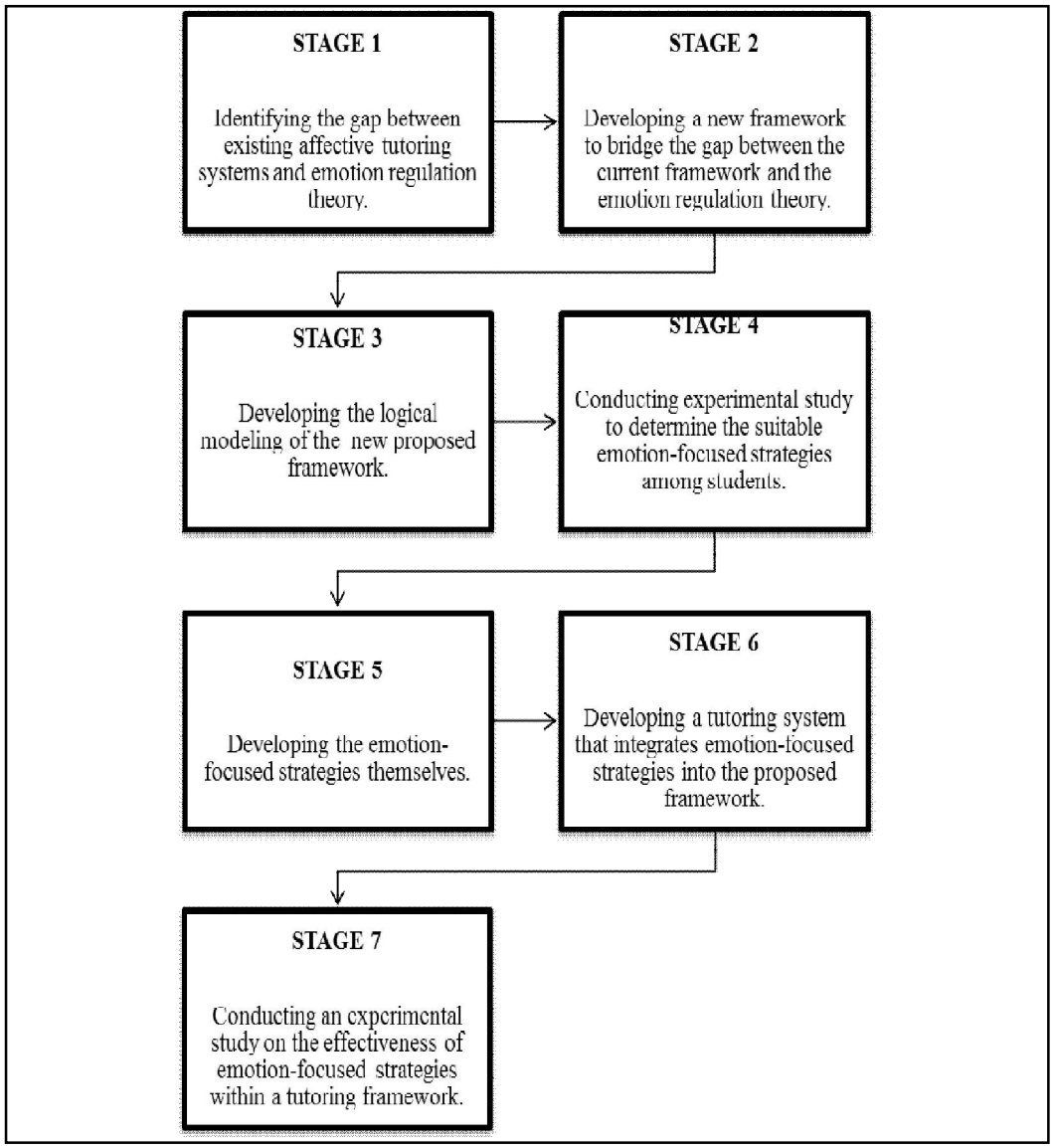

Figure 1.1 The research framework of the thesis

Identifying the gap between emotion regulation theories and the current implementation of existing affective tutoring system is the first stage of this study. Emotion regulation theory proposed a two appraisal phases of self-regulation process. The first (primary appraisal) should be conducted before the start of a lesson, while the second (secondary appraisal) is expected to be conducted during the lesson itself. However, existing affectivetutoring frameworks implement only one level of appraisal process which is during the lesson although this may happen several times during the lesson.

The second gap concerns the strategies deployed in the reaction phase of the emotion regulation process. Individuals are expected to use both problem-focused and emotion-focused affectivestrategies as their reaction to regulate their overly intense elicited emotional (Lazarus 1991; Grosset al. 2011). In contrast, current affective tutoring system deployed only problem-focused strategies to regulate student's elicited emotional state.

To bridge the gap, a new framework (Stage 2) which was an extension of the current affective tutoring system framework was proposed: 1) the introduction of a primary appraisal and reaction phase at the beginning of a lesson and 2) the inclusion of emotion-focused strategies into the reaction phases of the ASR framework.This framework was derived from the analysis of emotional intelligence framework (Picard 2010), self-regulation strategies (Lazarus 1991; Bandura 2011; Gross et al. 2011) and OCC model (Ortony 2003). To strengthen the framework, formal definitions of the ASR appraisal and reaction mechanismswere developed using predicate logic technique (Stage 3).

In contrast to the traditional affective tutoring framework, emotion-focused strategies for helping students to cope with their elicited state of emotions were introduced. However, as there has been little study on the use of emotion-focused strategies in tutoring system environment, two exploratory studies (Stage 4)to explore and identify suitableemotion-focused strategies within a tutoring system framework had to be conducted.Two potential candidates as the active regulation strategies to be integrated into the ASR framework have been identified. The first potential strategy is the *Relaxation Exercises* strategies, and the second potential strategy is the *Doa* strategy.

Following the results, the mechanism or material for the identified emotion-focused strategiesto suitstudent's tutoring environment was developed (Stage 5). For the relaxation exercise, materials from the *progressive muscles relaxation* and the *relaxation response*were used.In comparison, materials derived from Al-Quran and Hadith were adapted for the Doa strategy. The *Doafor learning*was chosen as the author believes that it is suitable for a tutoring system environment.

Finally all the components were brought together in a working system (Stage 6). The effectiveness of the system was then tested and evaluated in an experimental study conducted with students from the College of Information Technology, University of Tenaga Nasional. In total, 83 participants were involved in the experiment (Stage 7).

1.6 OVERVIEW OF THE THESIS

The thesis is organized into seven chapters. In general, the thesis presents detailed analysis, modeling, development and empirical study of the affective self-regulated (ASR) framework.

Chapter 1introduces the problem statement and the direction of the thesis.

Chapter 2 reviews the work that influences this thesis including emotion regulation theories, self-regulation strategies andaffective tutoring systems.

Chapter 3 discusses the research methodology deployed throughout the study. This includes the rational and explanation of thechosen researchmethodology at each phase of the study.

Chapter 4 describes the development of the ASR framework based on groundingtheories of emotion regulation which underpin the ASR framework. It includes the rationale, modeling and algorithm for the two phases of ASR framework; the appraisal and reaction phase.

Chapter 5 presents the development of the problem-focused and emotion-focused strategies for the reaction phase of the ASR framework. This includes discussion of the exploratory and validation studies in identifying the suitable emotion-focused strategies for the ASR framework.

Chapter 6 discusses the implementation of the empirical study used to evaluate the ARS framework, analyses the results and provides the overall conclusions of the work.

Chapter 7concludes the thesis by reviewing and critiquing the work done proposing future work.

CHAPTER II

LITERATURE REVIEW

2.1 INTRODUCTION

There is a growing recognition that emotional intelligence plays important roles in learning (Gross et al. 2011; Pekrun 2011; Wilson et al. 2012). Emotional Intelligence can be broadly defined as the ability of one to monitor one's own and others' emotions, to discriminate among these emotions and to use this information to guide one's thinking and actions (Mayer et al. 2012). The development of emotional intelligence skills is expected to guide individuals to cope better with the demands of daily life, including life satisfaction, the quality of interpersonal relationships, and success in occupations (Bar-On 2001; Mayer et al. 2012).

Mayer et al. (2012) proposed an emotion intelligence modelthat assists people in integrating emotion and thinking. In this model, three main pillars of the emotional intelligence conceptweredefined asshown in Figure 2.1.

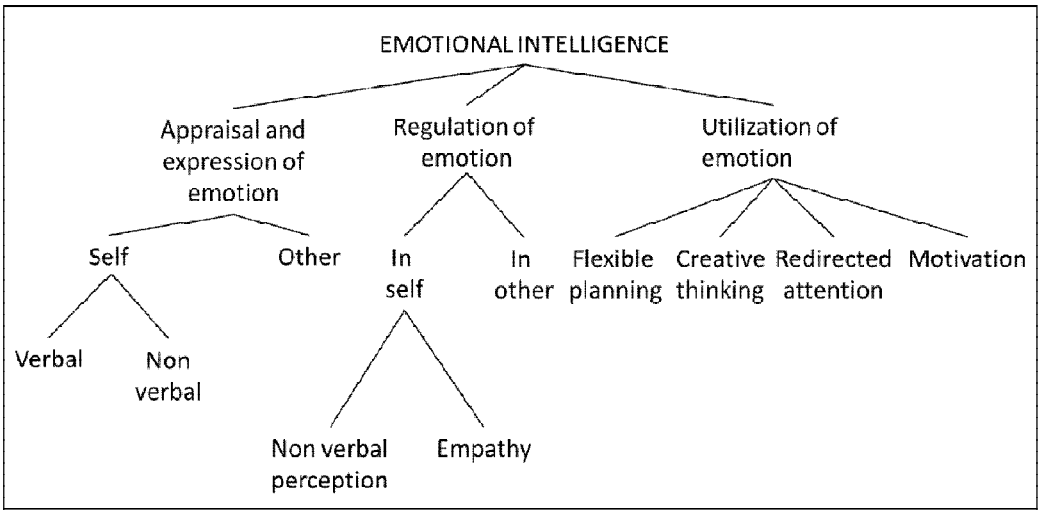

Figure 2.1 The Conceptualisation of Emotional Intelligence (adapted from Mayer et al. 2012)

According to this model, an emotionally intelligent individual should possess the ability to appraise or recognise his own emotional state and those of the people around him (Mayer et al. 2012). Such ability should allow an individual to choose the appropriate affectivebehaviour, thus improving his social relationships.

Emotionally intelligent individuals are said to be particularly adept at regulating their emotions. This involves the deployment of a variety of methods including the emotion-focused (relaxation exercise or Doa) and problem-focused strategies (Try hard to understand the details of the problem) (Lazarus 1991). The possession of good emotion regulation skills enables individuals to become more adaptive in solving their personal problems.

Finally, Mayer et al. (2012) proposed that an emotionally intelligent individual should be able to use his emotions by motivating himself and the people around him to deal with challenging situation. Within an education context, there is evidence that the utilization of students' emotional state would be able to improve their learning engagement and their academic achievement (Bandura 2011; Pekrun 2011; Wilson et al. 2012).

For example, enhancing the students' appraisal and recognition of emotional state skills (Glaser-Zikuda et al. 2005;Pekrun 2011) within a learning context (Jarvela et al. 2008; Van der Meij 2008; Pekrun 2011) can foster better learning interactions (Parker 2002; Pekrun 2011) and achievement (Pajares & Schunk 2002; Bandura 2011).

2.2 EMOTION REGULATION PROCESS

According to Frijda (1986), people not only just "have" emotions, but they also regulate them to suit their goals. Gross et al. (2011) defined emotion regulation as the process of modulating and managing individual emotional state. These modulation activities are directed towards achieving individuals' conscious or unconscious goals (Bandura 2011). They are aimed to remediate or moderate any overly intense negative emotional or positive emotional state. The emotion regulation adaptation skill has also been recognised as a major component of the Emotional Intelligence concept (Mayer at al. 2012; Rivers et al. 2012).

Lazarus (1991) postulated two stages of the individual's emotion regulation mechanism. The first stage,which he called as the primary appraisal stage, evaluates the relevance of the potential emotion elicitor to the individual. Similarly, Grosset al. (2011) proposed that the primary appraisal phase should take place before an emotion has become fully activated. The evaluation then leads to a set of coordinated behavioural, psychological or experiential emotional response (Gross et al. 2011). According to Lazarus (1991), the affectivestrategies should focus on using available resources to moderate the undesired conditions and thus moderate the elicited emotional state. For instance, a weak student who is unprepared for a test might decide to ask his friends as a strategy to make him feel better. Similarly, reciting doa before an examination by students is another example of an emotion regulation strategy.

The second emotion regulation process happens after the emotion has been fully activated (Lazarus 1991; Gross et al. 2011). Lazarus (1991) referred to this regulation process as the secondary appraisal phase. The aim of the secondary

regulation process is to manage the elicited emotional state. It involves behaviour or cognitive responses or strategies that are designed to reduce, overcome, or tolerate the demands placed on the individual. People have been observed using different strategies to deal with their elicited emotional states depending on their background, knowledge and culture (Lazarus 1991; Ortony et al.2003).

As an example, Asian students are culturally reserved. To them, revealing personal problems to others can cause shame for themselves. Thus, they tend to keep to themselves and endure the problem without revealing it. Furthermore, Yeh (2005) found that the Asian immigrant students in the US are more likely to use religious practice as compared to their local students. In contrast, European students are more self-expressive in confronting learning problems (Lam & Zane 2004). They are more likely to discuss their problems with classmates and teachers. Lazarus (1991) classified the strategies used by individuals to deal with the different intensities of the elicited emotional state into two categories: Problem- focused strategies and Emotion-focused strategies. In the following section, the reviews of these strategies are presented.

2.3 PROBLEM-FOCUSED STRATEGIES

Lazarus (1991) refers to problem-focused strategies as active or as direct cognitive or adaptive behavioural efforts to work on the problem itself. It involves attempting to change the problem by generating and implementing options and steps to solve or make the problem less problematic (Bandura, 2011). Seeking information about what to do or confronting the person or persons responsible for one's difficulty is examples of such strategies.

In the context of learning environment, du Boulay et al. (2010) reported that the deployment of different problem-focused coping strategies (i.e. by scaffolding students using different levels of help) have a positive impact on their affective state and improved their performance. Likewise, Baker and Berenbaum (2008) reported that the use of problem-focused strategies (different levels of help) improved students' problem-solving skills.

2.4 EMOTION-FOCUSED STRATEGIES

Emotion-focused strategies refer to thoughts or actions whose goal is to relieve the emotional impact of stress. Such strategies do not actually alter the threatening domain or damaging environment but are apt to just make the person feel better (Gross et al. 2011). Avoiding thinking about trouble, denying that anything is wrong, distancing or detaching oneself by deep breathing or doing relaxation therapy are examples of emotion-focused strategies.

Although results from the literature indicated that inclusion of emotion-focused strategies can improved student emotions in a learning environment, very few attempts have been made to study the effects of such strategies within a computer mediated environment, and in particular within the affective tutoring system (ATS) community. Therefore, there is a clear need to review the use of these strategies within other research disciplines so that their findings and recommendations could be adapted within the ATS framework. Thus, the emotion-focused strategies are further reviewed.

2.4.1 Relaxation Exercises

The benefits of relaxation exercise, including reducing individuals' negative affective state and helping people cope with their psychological state, have long been established. The legacy of this relationship can be traced as far back as the 1930s. Jacobson (1938, cited in Schlutteret al. 2011) presented the idea in his book *progressive relaxation*, published in 1938. He believed that a person could reduce his negative emotional state by learning to make himself relax. He discovered that, by applying his *progressive relaxation* method of muscle tensing and releasing, a deep state of relaxation in those muscles could be achieved. Over the years, evidence from many studies has indicated that the use of *progressive relaxation* has helped treat a number of medical conditions such as high blood pressure and ulcerative colitis (Wilson et al. 2012).

According to the *progressive relaxation* approach, a human bodys organised into four common physiological groups: 1) hands and arms; 2) head, neck, and shoulders; 3) torso, including chest, stomach and back; and 4) thighs, buttocks, legs, and feet. The method begins by asking the patient to lay or sit in a comfortable position. Following this, the patient is presented with the relaxation therapy for the first muscle group. This includes, asking the patient to tense those muscles, holding the tension for approximately five seconds, and then release andrelax the same muscles for up to 30 seconds. This allows the individual to notice the contrast between the feeling of muscular tension and the feelings of muscular relaxation. The procedure is repeated with the next muscle in the group, and so on, until all the muscle groups have been treated.

The *progressive relaxation* session can be conducted either through guided verbal cues and scripts which can be memorized by the patient or provided on instructional audiotapes (Wilson et al. 2012). Some individuals may prefer progressive relaxation prompted by an audio tape, because it allows them to completely clear their mind and just follow the cues allowing them to feel the difference between tensed and relaxed muscles easily. In his original idea, Jacobson (1938) developed a series of 200 different muscle exercises and a training programme that took one month to complete. An example of the *progressive relaxation* procedure is in Appendix A.

Benson (1975) published his groundbreaking work *The Relaxation Response,* which described in detail the stress-reduction mechanism in the body that short-circuits the "fight-or-flight" response, lowers blood pressure, relieves muscle tension, and controls heart rate (Wilson et al. 2012).

The essence of Benson’s method was to produce a simple and easy method to learn. Benson believed that his relaxation technique was preferable to other techniques because it is easy to administer and produces effects equivalent to those of more complex techniques (Wilson et al. 2012). If one follows the simple steps necessary to elicit the *relaxation response,* the benefit to the body can be predicted reliably. These include: a decrease in blood pressure, diminished respiratory rate, lower pulse rate,

and diminished oxygen consumption. An example of relaxation response procedure can be found in Appendix A.

Many benefits have been reported to be associated with relaxation exercise. Some of the general benefits include a reduction of general anxiety, prevention of cumulative stress, increased energy, improved concentration, reduction of some physiological problems, and increased self-confidence (Schlutter et al. 2011). At present, *progressive relaxation* and *relaxation response* are the most commonlyused techniques used in various research disciplines. However, there are also several other hybrid or alternative methods, such as cue-controlled relaxation and cognitive relaxation, which are extensions of these two techniques.

Most of the early evidence for the successful application of relaxation exercises is found in medical research. This is, however, not surprising since the relaxation exercises were first developed by medical practitioners as an alternative treatment for several illnesses. One area where relaxation exercises have been found particularly useful is in the treatment of clinical anxiety. There is substantial evidence that relaxation techniques are highly efficient in reducing the patient's anxiety levels and thus producing long-term health benefits (Zebis et al. 2011; Wilson et al. 2012).

Ortiz and La Grange (2006) conducted a study of the relationship between progressive relaxation techniques (Jacobson 1938) and the performance of female recreational golfers. There were 18 subjects in the study (9 in both the experimental and the comparison groups) which was conducted over a 3-month period. The dependent variables included the scores per 9-hole round, the number of putts per round, and the number of greens hit in regulation. The level of improvement observed in the experimental group was greater, thus suggesting that progressive relaxation exercises technique appears to enhance female recreational golfers' performance.

In another study, Zebis et al. (2011), focused on the effect of relaxation exercise on non-specific neck and shoulder pain among 537 industrial workers. Results of the study indicated that relaxation exercise can significantly reduce participants' neck and shoulder pain. Similarly, Vancampfort et al.(2011) examined

the effects of progressive muscle relaxation on state anxiety and subjective well-being in people with schizophrenia. They concluded that Progressive muscle relaxation was highly effective in reducing acute feelings of stress and anxiety in patients with schizophrenia. To them, the reduction in stress and state anxiety was associated with an increase in subjective well-being.

Several studies have suggested that there was a positive relationship between relaxation exercises and students' performance within the classroom environment. Benson et al. (2000) studied the relationship between the *relaxation response* curriculum and academic achievement amongst middle class students. Teachers were trained to teach the relaxation exercises curriculum and self-care strategies to their students. Four measures of academic outcome were analyzed: grade point average, work habits, cooperation, and attendance. The results of the study showed that students who had more exposure to the relaxation exercises curriculum showed an improvement in their grade point average scores, work habit scores and cooperation scores over the course of a two-year period (Wilson et al. 2012).

Benson et al.'s (2000) findings were further explored by Deckro et al. (2002). In their study, they examined the effect of six weeks of relaxation exercise intervention on college students' physiological stress and anxiety levels. One hundred and twenty eight students were randomly assigned to an experimental group (n = 63) or a comparison group (n = 65). The experimental group received six 90-minute group training sessions using the *relaxation response* and cognitive behaviour skills. The Symtom-Checklist-90-Revised, Speilberger State-Trait Anxiety inventory, and the Perceived Stress Scale were used to assess the student's psychological state before and after the intervention. Ninety students (70% of the original sample) completed the post assessment measure. The findings of the study suggested that there were indeed significant reductions in psychological distress, state anxiety, and perceived stress between the experimental group and the comparison group.

In more recent study, Wilson et al. (2012) extended the earlier research of Benson's group (Benson et al. 2000; Deckro et al. 2004). They taught teachers in a local public high school the relaxation response curriculumthat used diaphragmatic

breathing, imagery, and relaxation training. The relaxation response technique was then implemented in their classroom setting. The changes in self-reported teachers and students health behaviors, perceived stress, and anxiety were assessed using a pre-intervention/post-intervention survey. They reported that a significant increase in the use of positive health behaviors among students and teachers. Students were also reported to have significantly less state and trait level anxiety after receiving the interventions.

Likewise,Dolbierand Rush (2011) examined the abbreviatedprogressivemuscle relaxation (APMR) in enhancing physiological and psychologicalfunctioning such as *electrocardiograph heart rate,heart rate variability (HRV) and salivary cortisol* among high-stress college students.Results from the study indicated that the APMR technique has significant short-term effects, both reducingdetrimental and enhancing beneficial functioning in high-stresscollege students.

There has also been an attempt to develop commercial computer-based relaxation exercise software which has produced a positive result (TestEdge® 2003). TestEdge® (2003), has developed the software which integrates positive-emotion focused and relaxation exercises techniques as a way to tackle and improve users' affective state anxiety levels. Results from a three week pilot study amongst groups of high school students, revealed that the students who used the software were observed to record a 35% improvement in math scores and a 14% improvement in reading scores.

In another attempt, Wang et al. (2004) conducted a pilot study to examine the effects of Tai Chi Quan, a body-mind harmony exercise, on college students' perceptions of their physical and mental health. A three-month intervention of Tai Chi exercise was administered to college students. Multidimensional physical and mental health scores were assessed using a health survey questionnaire before and after the intervention. Thirty college students participated in a 1-hour-long Tai Chi exercise intervention twice a week for 3 months. Each practice session included 10 minutes of breathing and stretching exercises followed by 50 minutes of Tai Chi Quan 24-form practice. They concluded that the Tai Chi exercise had positive effects on the self-assessed physical and mental health of college students.

In a more recent study, Vitasari et al. (2011) used breathing retreatment and relaxation as a treatment to overcome students' anxiety in learning. Results from the study indicated that the use of intervention strategies have managed to significantly reduced students' anxiety level measured using their breath per-minute but not their academic performance. In a similar vein, Zaheri et al. (2012)reported that the use of relaxation exercise regularly able to reduce stress and a good training to enhance study skill which could lead to the reduction of test anxiety level among students. According to Carbonell (2012), a few hours of meditation training can improve self-control, mood, stress response and immunity response.

Nevertheless, there have also been a substantial number of studies which have produced contrasting results. Using the Jacobson relaxation method on 48 undergraduate students, Job and Depamo (1991) studied the relationship between relaxation exercises and students' anxiety levels and learning performance. Results from this study revealed that there was no significant difference in anxiety level and learning gain between the control and the experimental groups. In a similar fashion, Gaines (2005) conducted a study to examine computer anxiety and its relationship to four interventions including relaxation exercises. They found that relaxation treatment was ineffective in reducing computer anxiety levels among subjects in the study. In another experiment, the relaxation exercise training was found not to be significant to treat patient's anxiety disorder (Norton 2011).

In view of this inconsistency, Norton(2011) has suggested two explanations. His first argument centered on the non-standardized procedure and the difficulty level of the task. He pointed out that while some of the studies required subjects to do one-off relaxation session (Gaines 2005; Söderberget al. 2006), others have used relaxation exercises in several repeated sessions, which provided extra practice for the subjects (Deckro et al. 2002;Wilson et al., 2012). Consequently, the latter approach is more likely to produce a better result in improving participants' affective states. This is consistent with the findings by Wilson et al. (2012) who pointed out that subjects in their studies enjoyed the benefits of relaxation exercises only after a fair amount of practice.

The second explanation for the difference in outcomes is due to the difficulty or complexity of the tasks. For example, Söderberg et al. (2006) looked at a simple recognition task, while others such as Depamo and Job (1991) applied the technique to a more complex and difficult task. It is therefore, plausible that an increase in a task's difficulty impacts on how far the students are able to improve in their learning performance.

A more comprehensive explanation of this issue is offered by the Houston Independent School District (Gaines, 2005). They have identified six potential problems with relaxation exercise studies:

a) There were too few training sessions. Due to this, they argue that the participants were unable to efficiently perform the relaxation session and this had a negative repercussion on the participants' affective states.

b) Little follow-up beyond treatment. They argue that the benefit of the relaxation exercise last only during the treatment session. However, in some of the studies, the measurement of relaxation exercises sessions were taken far beyond the treatment period where the effects of the relaxation exercise has become less valuable.

c) No longitudinal examination of the cumulative effects of different relaxation training strategies used in the relaxation studies.

d) Insufficient description of the relaxation procedure used in the studies. Consequently, without a detailed description, it is hard to draw conclusions about the relaxation session because different researchers may have provided different treatment under the rubric of the same procedure.

e) Lack of clear rationale for the participants. In some experiments, voluntary participants sometimes felt there was no reason to improve their performance. As a consequence, a certain level of emotional state failed to be elicited and this may also have decreased the effectiveness of relaxation exercises session.

f) Examining the average effect of relaxation exercises of the group rather than the individual within the group. This approach, they argue, meant that the researchers were unable to record important information about how individuals reacted to the relaxation session.

In summary, a substantial amount of research on the application of relaxation exercises across a wide spectrum has been presented. There is significant evidence to support the premise that relaxation exercises can be useful in reducing participants' negative affective state (Gaines 2005) and in enhancing their academic achievement (Carbonell 2012; Wilson 2012). Nevertheless, there are also several studies which report the failure of relaxation exercise in improving participants' affective state or in enhancing their academic achievement (Norton 2011).

2.4.2 Prayer

Prayer or supplication is one of the greatest acts of worship (*ibadah*) in Islamic jurisprudence. According to the famous Islamic scholar Al Ghazali (cited by Nakamura 2010), prayer is about "professing gratitude and glorifying and exalting God" It is "the heart of religion and faith". It is also the manifestation of relationship between a needy servant and his Al-Mighty to whom everything is returned. During the prayer, one reaffirms one's devotion towards Allah, thank Him, and ask for guidance and blessings. In a hadith, the prophet Muhammad (S.A.W) has taught his companion to pray to Allah asking for His protection. He said

> *"Shall I introduce to you a weapon which will protect you both from the evils of enemies and increase your sustenance? They said: Yes, O Messenger of Allah. The Holy Prophet of Islam (saw) replied: Call your Lord day and night, for "Dua" is the weapon of a believer[1]."*

In another hadith, the prophet is known to have said that prayer is the means to purify Muslim's heart:

> *" There is a polish for everything that removes the rust and the polish for the rust of the heart is zikir/Doa[2]"*

There are also many verses in the Quran that express the importance of prayer. For example, Allah mentions:

> *"And when My servants ask you concerning Me, then surely I am very near; I answer the prayer of the supplicant when he calls on Me, so they should answer My call and believe in Me that they may walk in the right way[3],"*

[1] Al-Hadith, Shahih Muslim
[2] Al-Hadith, Shahih Bukhari
[3] Al-Quran, Al-Baqarah, 186

In another verse:

> *And your Lord says: "Call on Me; I will answer your (Prayer): but those who are too arrogant to serve Me will surely find themselves in Hell - in humiliation![4]"*

Generally, there aretwo types of prayers in Islam. The first type of prayer is a mandated obligatory worship of the Almighty on all Muslims, both men and women, from the age of adolescence until death (York 2011). This type of mandatory daily (five times a day at specific times) worship of God is called '*solat'*. It holds the most important role of all Islamic prayers (Abdel-Khalek 2011). *Solat* constitutes physical, mental, and spiritual submission to God and is the most central rite of Islam (York 2011).

Elias (2008) purported that the benefits of *solat* are fourfold: spiritual, psychological, physical, and moral. It brings spiritual benefit to one because the ritual prayer is a form of worship. As for psychological benefit, the concentration on prayers can divert one's mind from pain. Moreover, the prayer allows for full bodily movements which cause some organs such as the muscles to relax and, finally *solat* brings moral benefit because it often produced happiness and satisfaction by suppressing anxiety and extinguishing anger (York 2011).

Nevertheless, *solat* has certain pre-conditions that must be met in order to perform it. The first condition is that one must be in a state of purity known in Arabic as *wudu*. Secondly, one must also be wearing clean clothes and be in a clean place. And, more importantly, the obligatory *solat* must be strictly performed five times per day at its specific time: at dawn, noon, afternoon, sunset, and evening.

The second type of prayer in Islam is *Doa* or supplication. *Doa* is the verbal expression of the divine feeling to Allah the Mighty creator. According to Ghazali, *Doa* is simply the *Quranic* version of supplication. The simplest *Doa* of Islam is the utterance of God's Name - Allah. In fact, there is Doa for just about any action or

[4] Al-Quran, Ghafir, 60

situation. The essence of *Doa* is about bringing mankind closer to Allah. It is very common that Muslims perform their own *Doa* after *solat*. It should be also pointed out that in this thesis; the concept of *Doa* or supplication is interchangeable with *dzkir* (i.e. the act of utterance of the name of Allah repeatedly).

Ghazali (cited by Nakamura 2010), argued that *Doa* or supplication not only brings back to the remembrance of God, but also give to it humility (*tadarru'*) and submissiveness (*khusyuk*) to God. This mental or meditative exercise helps individual to engage more ardently in the remembrance of God and if this is repeated regularly, it becomes more effective(Nakamura2010). As the result, individuals at treating and healing emotive and cognitive stress based on Al-Quran and *sunnah* achieve good balance through spiritual means. According to the Qur'an and hadith, prayer, including *solat, dua'a, dhikr,* and *Quranic* recitation brings a person closer to God (Qur'an 2:152) and it was often prescribed as a treatment for various conditions and ailments.

The main source of *Doa* in Islam should be derived from Al-Quran and Hadith. In fact, the opening surah of the Quran (*Al-Fatihah*) itself which is recited by Muslims during their obligatory prayer (17 times a day) is a very complete Doa (York 2011). Moreover, according to Ghazali (cited by Nakamura 2010), the Prophet Muhammad has taught his companion and *ummah* with *Doa* that covers almost every angle of our life.

In recent years, there has been an increased attention on the importance of *Doa* and prayer in many disciplines (medicine, psychology, workplace). Research has shown that *Doa*is associated with many positive outcomes including, but not limited to, improved ability to cope with stress, reduced incidence of depression and anxiety, reduced risk for suicide and criminal behavior, and decreased usage of tobacco, drugs, and alcohol (Abdel-Khalek 2011). In a more recent study, York (2011) studied the effect of *Doa* on non-Muslim. Results from the study suggest that *Doa* can be an effective healing modality for a non-Muslim.

Unlike the western approach, Islamic supplication or *Doa* in Islam is bound to its guidelines, principles and etiquettes. Elias (2008) has underlined at least two important principles for the implementation of Islamic supplication (*Doa*) as follows:

a) The overall goal of *Doa* in education setting is to help students become better *muslim*, that is, to lead their life according to *syariah* principle

b) The strategies or techniques should not deviate from the principle of *syariah*, not only must the goal of the strategies be Islamic, the intervention should also related to *syariah* law.

As for etiquettes, Islamic scholars have underlined the necessary etiquettes to be followed for *Doa* to be answered by the All Mighty as follows:

a) Sincerity – Muslims should sincerely believe that one must submit only from to Allah (SWT) alone.
b) An attentive heart – It is vital to make *Doa* with a mindful heart for Allah (SWT) is the Lord of Honor
c) Purity - Purity and lawfulness in our food is important for the *Doa* to be granted.
d) Persistence – Muslim must be persistent in making *Doa*, and should avoid giving up as no *Doa* is ever wasted. (Qadhi 2001)

In the learning context, there are several Doa taught by Islamic scholars to help students during their learning episodes. For instance, before the start of a lesson, a student can recite:

> "*Allah! Make useful for me what You taught me and teach me knowledge that will be useful to me*" (Qadhi 2001)

After a lesson, students are encouraged to recite:

> *"(O Allah!) Bring it back to me when I am in need of it. (O Allah!) You do whatever You wish, and You are my availer and Protector and the best of aid"* (Qadhi 2001*)*

In fact, it is common to observe students using Doaas the means to help them moderating their overly intense emotional state in learning. For example, the following*Doa*is recommended to be used by anxious student to regulate his/her emotional state:

> *O Allah! I seek refuge in You from anxiety and sorrow, weakness and laziness, miserliness and cowardice, the burden of debts and from being oppressed by men (*York 2011)

In the context of computer mediated environment, the author asserts that *Doa* is more suitable strategy to be implemented as compared to *solat*. Unlike *solat*, *Doa* does not require the performer (i.e. student) to be in a state of purity (*wudu*). This fits the nature of the computer tutoring system which allows students to learn their lesson at their own convenient time. Moreover, *solat* requires extensive physical movements (i.e. There is 13 conditions (*rukun*) in*solat*). These extensive movements are not suitable for students learning activities as they can distract students' focus and learning orientation. In contrast, *Doa* is more flexible and adaptable. *Doa* does not require special conditions (*rukun*) and can be performed at any time or place. Thus, it can be easily adapted and integrated into the tutoring system environment.