Affect Awareness Support and Communication Technologies in Education

Hippokratis Apostolidis
Aristotle University of Thessaloniki, Greece

Thrasyvoulos Tsiatsos
Aristotle University of Thessaloniki, Greece

INTRODUCTION

Emotional intelligence is one of the main factors in building social human relations and skills. Affective computing is the scientific field providing support to emotion recognition and affective awareness, promoting the emotional intelligence.

Investigating student emotions during learning is critical because learning at deeper levels of comprehension is inherently an emotionally rich experience (Schutz & Pekrun, 2007; Calvo & D'Mello, 2011). A very important feature of learning environments is the support provided to students and to the instructor. Usually in a learning activity the emotional states involved are ignored. In such cases it is possible that the teacher will be misled to wrong decisions. Unfortunately most of these decisions may have bad influence to class performance. The emotion recognition through the presented anxiety awareness application, in many cases, can motivate students in order to regulate their emotional state or try to relax their team-mates in case of stressful conditions during collaborative learning activities.

From the most known research so far, it is concluded that the student emotional regulation contributes to the enjoyment of learning and the reduction of the anxiety. Emotional intelligence applied in education is trying to promote cognitive and communication skills.

A very important feature of learning environments is the support provided to students and to the instructor. Students' anxiety coming up during the learning environment and teacher behavior regulation in respond to this affective state could play a very important role to educational support and adaptivity.

This work is trying to examine whether the usage of bio-feedback techniques and stress awareness affect the student's performance in demanding educational activities, presenting a brief background bibliographic information, the research issues, the developed bio-feedback application, its evaluation and the conclusions. Finally there is a section about the future work.

BACKGROUND

Affective computing is the scientific field providing support to emotion recognition and thus promoting the emotional intelligence.

The primary practical goal of affective computing is to create technologies that can monitor and respond to the affective states of the user (Picard, 1997).

The synthesis and analysis of emotions is an interdisciplinary scientific field consisting from the combination of computer science, psychology and cognitive science (Allen & Carifio, 1995).

Body language as facial expressions, posture and gestures can reveal the 55 percent of the emotional meaning of a message, the tone of the voice can represent the 38 percent of the emotion meaning and the remaining 7 percent can be communicated through explicit verbal channels (Mehrabian, 1969). There is good evidence that in psychophysiology research, the physiological activity associated with emotions can be systematically organized in affective valence and arousal (Bradley, 2000).

Affective computing uses many physiological techniques in order to collect bio-signals from human beings. Bio – signal processing and analysis, applying

DOI: 10.4018/978-1-4666-5888-2.ch235

in most cases machine learning techniques, often leads to emotion detection and measuring.

Emotions are very important functions that affect students' motivation, behavior and performance.

Many researches started in 1950 (Zeidner, 1998) have considered with students anxiety during tests and produced sufficient knowledge that can inform the educational practice.

The influence of emotions during problem solving, and participation in educational activities is very important because it can affect positively or negatively the learning process (Allen & Carifio, 1995). Efforts to study difficult subjects at deeper levels of comprehension involve a complex coordination of cognitive processes and affective states (D'Mello, 2012). According to modern emotion theories, the strong or weak emotion arousal depends on how great a difficulty is and the valence, positive or negative, depends on how the person evaluates the inconvenience that has been appeared to him (Mandler, 1984b; Lazarus, 1991).

RESEARCH WORK

This research considers with the students' intensive emotions, anxiety and even frustration, leading to indifference or boredom, which can be appeared during demanding educational activities. It also examines how these emotions can be recognized, what are their effects in students' performance and cognition skills development and what interactions might be undertaken in order to avoid the establishment of negative emotions in a classroom.

Main Issues

This work is trying to examine whether the usage of a bio-feedback technique and stress awareness affect the student's attitude and performance during deep learning activities. More specifically it explores whether the student anxiety awareness is supportive to the student and to the teacher participating in intensive educational activities. So the main issues of this work are:

1. Whether anxiety bio-feedback can be approved a supportive factor to learning activities, provoking students' motivation and skills for self-regulation.
2. If bio-feedback techniques (i.e. diaphragmatic breathing), suggested by the psychologists can support students to achieve high anxiety relief which may induce positive cognitive attitudes.
3. It is also examining whether student's anxiety bio-feedback from the teacher's point of view during critical and demanding educational activities can support his/her behavioural adaptation to reduce student anxiety and can also guide the teacher in order to adopt best practices of student support.

There is often a skeptical attitude toward the human contact with sensors which sometimes are annoying and they make some movements uncomfortable especially when they are attached to hand fingers. In addition we could consider that usually students who participate in educational activities are under stress and their tolerance to sensor contact is very limited.

Solutions and Recommendations

This work uses three physiological techniques in order to collect bio-signals from students who are engaged in a learning activity. The techniques used are Galvanic Skin Response (GSR), the skin temperature and Heart Rate (HR) measurement. The electrical circuits designed for detecting these signals are connected to an Arduino duemillanove (http://www.arduino.cc/) board which is used as an analogue to digital converter. The open-source electronics prototyping platform Arduino duemillanove was programmed in such away to send the bio-signal values through USB port or bluetooth to a computer application.

In this research we focused on sensors that could be comfortable enough as well as sensitive in their measurements. Our main effort was to use as less obtrusive sensors as possible putting the GSR and skin temperature sensors in a bracelet fitted around the wrist and the HR sensor in a clip adjusted on human's ear (Figure 1). The GSR sensor resolution is 4.9 mv, the skin temperature sensor resolution is 10 mv and the heart rate sensor (Grove ear clip) measurement range is greater or equal to 30/min.

Psychometric Test

In this work it is assumed that each measurement object may have its own emotional areas. Thus it was decided that a psychometric test under the responsibility of a psychologist should precede the measurement activities. This activity included an interview process with