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Assessing stress in online learners

Stress is part of learning, but it must be managed so that it does not become a problem and affect the success of the training itself.

In an e-learning environment learners experience more loneliness and are more prone to stress.
The following research An Approach to Assessing Stress in eLearning Students explains how to estimate, in a non-invasive way, the stress levels of online learners and take measures to address it.

This work does not examine the measurement of stress using neuroscientific instrumentation to monitor brain and biological parameters (contrary to Peter et al, 2005), but rather an internal module within the Moodle platform specifically to detect the stress of learners. To do this, measurable parameters such as keyboard pressure, mouse movement, touch screen and webcams were used.

In online courses, the student-teacher interaction (also and especially the non-verbal aspect, which allows the teacher to balance the lesson based on the students' attitude) is lost.
In fact, the effectiveness of the training strongly depends on the trainees' state of mind, their emotions, self-esteem and individual learning styles.

These aspects should be taken into account in e-learning training. In a traditional classroom, the trainer is put in the (social) position of being more sensitive to the trainees' moods and can even predict the trainees' stress and take the necessary measures to mitigate it.
When training alone, this is impossible and it can be even more difficult for trainees to overcome stress.

Stress

Stress is the psychological and physiological response of strong mental and emotional pressure that the body puts on the body in the face of tasks, difficulties or events that are assessed as excessive or pressing. Indeed, stress can affect a person's body, thoughts, feelings and behaviour, but it is always the result of perception: if a situation is stressful for one individual, it is not for everyone. The ways in which everyone responds to stress are also different.
To date, excessive stress is the second most common cause of absence from work in Europe, after back pain (BT, 2002).

In students, and even more so in online learners, if the study load and other commitments are not managed, stress can build up to become a problem and prevent successful training.

In fact, recurring stress can

- reduce self-esteem and self-confidence,
- reduce memory and comprehension capacity,
- reduce the ability to study,
- create self-blame and self-doubt.

There needs to be a balance: too much stress can compromise physical and mental health, no stress results in a lack of challenges and opportunities.
The key to reducing stress is to identify strategies that suit the person as such, through **personalised training**.

Stress signals

Stress signals can be divided into four categories. In each category, each individual may experience certain symptoms (Melinda et al, 2012).

1. Thoughts

- Self-criticism
- Difficulty concentrating or making decisions
- Mental forgetfulness or disorganisation
- Worry about the future
- Repetitive thoughts
- Fear of failure

2. Feelings

- Anxiety
- Irritability
- Fear
- Mood
- Embarrassment

3. Behaviour

- Stuttering or other speech difficulties
- Crying
- Impulsive actions
- Nervous laughter
- Angry outbursts towards friends
- Teeth or jaw grinding
- Smoking, alcohol or drugs
- Increased number of accidents
- Increased or decreased appetite

4. Physical symptoms

- Tense muscles or muscle spasms
- Cold or sweaty hands
- Headaches
- Back or neck problems
- Sleep disturbances
- Stomach pains and intestinal disorders
- Frequent colds and infections
- Tiredness
- Rapid breathing or fast heartbeat
- Tremors
- Dry mouth

The importance of stress

Stress influences a person's body, thoughts, feelings and behaviour; because of this importance, its environmental causes and characteristics have been the subject of research in various disciplines.

In psychology, stress is defined as an emotion (positive or negative) that arises in response to specific situations. A high level of stress is accompanied by certain psychosomatic symptoms (as seen in the list above, Ortony, Clore and Collins, 1988). Furthermore, facial expressions have a systematic, coherent and meaningful structure that can be mapped to affective states (Beatty, 1982), (Picard, Vyzas and Healey, 2001).

Stress and e-learning in Moodle

eLearning platforms are becoming increasingly popular in both educational and academic settings and in corporate training. Currently, educational organisations cannot exclude themselves from the information society and are always faced with new technological challenges.
It is therefore important that training delivered online is effective and successful.

LMSs (Moodle was examined in the cited research) are very successful, however, their strength is not that they take great account of affective issues and the trainees' determination to learn (Rodrigues, Fdez-Riverola and Novais, 2011).

In the recent study we are discussing, stress detection was possible thanks to a sensor, the accelerometer, widely available in smartphones and tablets.
Specifically, each student interacted with Moodle from their real environment while attending a course. The devices used by each were equipped with sensors that acquired information in a non-intrusive manner. This information was recorded in a special module, called the 'stress recognition module', then the data was analysed contextually by the system, giving feedback to the teacher and the student. For example, the module would suggest a break to the student under stress or before they reached stress peaks.

Specifically, we talked about sensors (webcam, keyboard, mouse and accelerometer). What information did these tools provide?

- Touch pattern - the touch pattern represents the way a student touches the device and can record a change in intensity over a period of time. This information was acquired from touch screens with touch intensity support;
- Touch accuracy - a comparison between touches in active controls and touches in passive areas (e.g. without touch intensity support) where it does not make sense to touch. This information was also acquired by touch screen;
- Touch intensity - touch intensity represents the amount of force the learner exerts in touch. It is analysed in terms of maximum, minimum and average intensity of each touch. This information is also captured via the touch screen;
- Touch duration - represents the time interval between the beginning and the end of the touch event. This data is acquired from devices with touch screens;
- Amount of movement - the amount of movement estimates how and how much the student moves within the environment. This data is recorded using a webcam;
- Acceleration - acceleration is measured by the accelerometers of mobile devices. It is useful for building an estimate of how much the student is moving and how he/she is doing it. In addition, information from the accelerometer is used to support the estimation of touch intensity.
- Mouse movement - rapid mouse movements of low amplitude can indicate a high level of stress. These data were acquired from the mouse;
- Mouse clicks - the amount of mouse clicks and their frequency are useful for estimating how the student navigates the course and where they click. It is similar to the first four enumerated topics (pattern, accuracy, intensity and duration). This data is acquired from the mouse;
- Keyboard strokes - frequency and intensity of keyboard use.

The assumption is that when a student is stressed, he or she touches the interface differently, performing different movements and with lower touch accuracy.
The authors point out that an e-learning environment built with the devices and functionalities described could provide information on the context and status of the student, however the prototype of this system is still in the testing, validation and development phase.

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