ADAPTIVE SELF-ASSESSMENT TRYING TO REDUCE FEAR

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Abstract— **Almost everyone has experienced fear at least once in their life because of a test. Fear can positively mobilise students, when it is under control. However, when fear becomes excessive, it can completely destroy students' performance. Moreover, when dealing with a computerised test, fear can have an even more intense influence on students. The objective of this paper is to analyze about these issues and to propose an adaptive self-assessment system for reducing fear and supporting students' learning during the preparation for exams.**

Index Terms— self-assessment system; fear of failure; feedback; reducing fear;

I. INTRODUCTION

According to Gray [1] fear is a: "hypothetical state of the brain or neuro-endocrine system arising under certain conditions and eventuating in certain forms of behaviour". Examination conditions require an integration of various skills: Students are expected to read, understand, analyse, apply their knowledge and then present a structured answer to the questions [2]. However, these activities must be done within a limited time and often under strictly controlled conditions**.** As a result, students are often frightened of failing exams. Schafer [3] described fear of failure as: "perfectly natural and can help motivate you to prepare and perform well. Sometimes, however, fear of failure becomes so extreme that it creates unnecessary emotional and physical distress".

Though, a computerized learning environment for self-assessment before the exams could help to reduce students' fear and improve their knowledge. The computer would assess whether or not learning is advanced at a satisfactory pace and intervene appropriately. We refer to a system that would help students to reduce their fear of failure and enhance their cognitive weaknesses before exams, so that they will be "psychologically and cognitively equipped" to deal with the final test. We can not expect that tests like GRE (Graduate Record Examination) or GMAT (Graduate Management Admission Test) will incorporate any emotional or cognitive feedback routine into their code. However, a feedback routine incorporated into preparation tests for practice could help the candidates reduce their fear and advance their knowledge during preparation for the test. Thus, fear of failure would not disrupt students' training for the test. Whether feedback should be also incorporated into final exam tests, is a controversial matter. It could be however incorporated into the final tests of several courses in elementary or high schools, or universities.

The purpose of this paper is to address the issue of fear before and during a test, whether computer based or not, and to propose a self-assessment system for reducing students' fear and enhancing their learning during preparation for exams.

II. FEAR BEFORE AND DURING A TEST

Feeling fear before or during an examination is normal and it can, in certain limits, strengthen the student's performance. Without any fear of failure or encouragement to perform well on the test, a student is unlikely to put adequate effort into preparation or be sufficiently motivated when actually taking the test. Therefore he may not perform to his fullest potential. By denying a test importance the student may take an avoidant approach to the test, failing to prepare adequately or missing preparation lessons and, in extreme cases, failing to arrive for the test itself [4].

On the other hand, if before or during a test the student's level of fear is above the proper level, he may also fail to demonstrate his true abilities. Under these circumstances fear of the actual test may disrupt preparation and cause sufficient distress during the test to impair performance. Fear causes the amygdala, regions of the brain, to put the body on alert, quickly shutting down higher-order thinking, long-term memory, and our capacity to perform [5]. Therefore sometimes students happen to know the answers after the test, but not while taking it.

An essential characteristic of fear is that it motivates avoidance and escape [6]. Consequently, fear of failure may result in inactivity. Duley et al. [7] suggested that fear of failure represents an avoidance-oriented achievement motive that energizes achievement behavior to prevent demonstration of incompetence. Nevertheless, when a student avoids a learning situation, fear and other negative emotions can be strengthened [8].

Thompson [9] stated that failure-avoidant strategies are often observed to learners. These strategies include self-worth protection, self-handicapping, impostor fears, procrastination and defensive pessimism. With the term self-worth protection it is meant that students often avoid persisting on a learning task because they fear that failure could diminish their self-esteem. A similar tactic is self-handicapping. Some students appeal to have a handicap in order to avoid responsibility for a potential failure. They may even provoke injure to themselves before an important test. Thus, in case of failure it is not

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explicit whether their failure is due to low ability or due to the inconvenience provoked by their injury. Students being intolerant of their failure may use the tactic of procrastination, meaning that they may postpone undertaking a learning task. Impostor fears refer to students that are afraid of people losing respect for them because of low performance. The test taker fears the possibility that other key people (e.g., teachers, peers, or parents) will devalue him for poor test results [10]. Once assigned with a learning task he is deeply stressed, resulting in emotional exhaustion. The strategy of defensive pessimism refers to students that deliberately hold low expectations from the outcome of their learning efforts. While this strategy helps students cope with anxiety, it is also emotionally exhausting. Although failure avoidant strategies are differentiated between each other, all of them include fear of failure and avoidance of rigorous effort concerning a learning task. According to Thompson [9] they are motivated by the same need to protect a low or vulnerable self-esteem.

Fear of failure often accompanies low self-efficacy. Students who encounter difficulties are led to believe that they lack ability, and this belief leads them to attribute their difficulties to a defect in themselves about which they cannot do a great deal [11]. Individuals who doubt their capabilities and experience high levels of fear of failure are less likely to set and work toward goals, thus giving them no opportunities to increase levels of self-efficacy [12].

Students often have negative expectations, which do not allow them to focus in the leaning task. Their attention may be continuously disrupted by intolerable thoughts of disability and failure. Thus, each difficulty that the individual meets confirms his deeper perception: "I will not accomplish, the things will not go well". When someone expects the failure, there is a great possibility to behave with a way that leads to the failure, so the failure really happens and his deeper conviction is confirmed. Achebe [13] observed that in some students, self-defeating beliefs, and a fear of failure had a strong association with eventual exam failure, the very situation that they were trying to avoid.

In addition, there is research evidence that computerized tests may cause fear and anxiety in some people [14], [15], [16]. Computer anxiety is an affective response where people are worried about damaging the computer, looking stupid or losing control over their work [17]. Stanton and Barnes-Farrell [18] noted that a number of early electronic performance monitoring (EPM) studies demonstrate the possibility of increased anxiety and decreased task performance. Users with high task confidence should perform better, and users with low task confidence should perform less well because their performance is monitored by the interface.

However, according to Jettmar and Nass [19] users with high task confidence might in fact perform less well when interacting with adaptive software. This is because they would expect task difficulty to increase because of the user's own expected high initial performance. Fear of the tasks becoming increasingly difficult, might finally lead to stress, and to a decrease in performance. On the other hand, low task confidence participants should perform better when interacting with adaptive software, because they might expect the adaptation function to facilitate things for them. As their low task confidence would cause them to expect to perform weakly, they could also assume that the software will present them simpler tasks as the test progresses. This more positive anticipation should as expected decrease stress, increase self-confidence, and should lead to higher performance during adaptive testing than during non-adaptive testing.

The diversity among individuals shows that the same circumstances may be regarded as stressful by one individual, but not stressful by another. This is a key issue, because it points that it is an individual's view and interpretation of demands placed upon them that provokes malfunction to the individual, not the demands themselves [20]. We can help the individual to handle negative expectations when interacting with a computer system by providing adequate feedback.

III. FEEDBACK FOR REDUCING FEAR OF FAILURE

Feedback is best when it helps the student to overcome difficulties and is worst when it makes the student feel bad about him. Students usually believe they have understood the topic, but this is often not true in reality. As soon as they have to accomplish a task that is based on this new topic they realize their lack of understanding.

Therefore, tests should give the participants exercises, tasks or activities that challenge their understanding. Feedback should point out where the students' understanding is faulty and to correct any misunderstanding they have, but without undermining their confidence.

Positive feedback can influence and improve low self-esteem students in believing that they can accomplish and learn from the subject material that they feared the most [21]. Increased self-efficacy was found to have increased individuals' resistance to negative emotions like anxiety, distress and even fear [22]. If students frequently took practice tests self-efficacy would increase and they would learn more. Moreover, test anxiety would be reduced and immune systems might benefit. This sense also relates to stress-inoculation theory, whereby persons exposed to small doses of a frightening experience eventually experience less fear and anxiety [23].

Economides [24], [25] proposed an emotional feedback framework, taking as field of application the CAT (Computer Adaptive Testing) systems, in order to manage emotions (including fear). The emotional feedback can occur before and after the test, during the test, and before and after a student's answer to a question. In all these cases emotional feedback can be provided either automatically according to the student's emotional state, either by the student's or the teacher's request. Emotional feedback can be implemented by using beneficially positive emotions, while preventing, controlling and managing negative emotions. Moreover, the emotional feedback can also be implemented using negative emotions in order to increase the student's devotion and engagement. These "strategies" can be applied using humour and jokes, amusing games, expressions of sympathy, reward, pleasant surprises, encouragement, acceptance, praises but also through criticism and punishment.

A framework for designing emotional instructional strategies is the FEASP (fear, envy, anger, sympathy and pleasure) –

approach [26]. FEASP signify five most important dimensions of instructional related emotions: Fear, Envy, Anger, Sympathy, and Pleasure, aiming to decrease negative feelings (fear, envy, and anger) and to increase positive feelings (sympathy and pleasure) during instruction. The FEASP approach proposes four tactics in order to reduce fear during learning:

1) Ensure success in learning with the use of well proven motivational and cognitive instructional strategies.

2) Accept mistakes as opportunities for learning. This can be implemented through creative discussion with the students. As far as instructional technology is concerned students can be motivated to consider their mistakes as opportunities for learning with the use of questionnaires and success statistics showing that mistakes can enhance learning.

3) Induce relaxation through muscle relaxation exercises, visual imaginary, meditation etc. Computerized learning systems could induce relaxation with the use of trainings via media players.

4) Be critical but sustain a positive view, through optimistic expressions showing the beauty of things

An effective way to help a student to acquire control over his fear of failure is to make the student realize that fear. The reaction to the stimuli that lead the student to experience fear of failure is not a conscious one. Asking the student to name his fear makes these reactions part of student's consciousness, and as result the student could gain control over fear of failure. Damasio [27], [28] provided a clear distinction between emotions and feelings. In particular, Damasio distinguished between the physical state of the body (the emotion) and the perception of that emotion (the feeling). This order is actually reversed by other approaches [29], which call an emotion what Damasio would consider a feeling. An emotion is transformed to a feeling in the same way as a stimulus becomes part of human consciousness. An emotion could be considered as a stimulus that acquires intellectual qualities and therefore becomes a feeling, which is consciously evaluated. Consequently, it can be supported, that in order to call somebody's consciousness it is enough to address him a question with regards to his feelings, such as "how do you feel today?". Feelings are always admitted by a conscious being. When someone says, for instance, "I feel happy", he is in contact with his consciousness. In that sense, we could paraphrase the well-known phrase of Descartes "Cogito ergo sum" (I think hence I exist) to "Sentio ergo sum" (I feel hence I exist). Therefore, we make the assumption that just asking the student, during the test, to express the level of his fear, activates his consciousness, making it more possible for him to prevail over his fear.

IV. A SELF-ASSESSMENT SYSTEM TO REDUCE FEAR OF FAILURE

We propose that fear of failure could be healed through a self-assessment system, that would help the student to identify and improve his weaknesses. In addition, the system would try to help the student reduce his fear, providing adequate feedback. Thus, the student would receive psychological and cognitive assistance through his preparation for the exams.

To do so, the system should be able to evaluate students' fear of failure. We suggest that the fear of failure could be evaluated in advance using a computerised form of the Performance Failure Appraisal Inventory (PFAI) [30]. This 25-item questionnaire provides a higher-order composite score demonstrating general fear of failure, along with five scores for lower-order fears of failing based on particular consequences of failing. These include experiencing shame and embarrassment, depreciating one's self-estimate, having an doubtful future, having important others lose interest, and displeasing important others. Each item describes an exact consequence of failing and students can rate the force of their belief in each statement on a scale ranging from −2 (do not believe at all) to +2 (believe 100% of the time). The hierarchical, multidimensional model of PFAI responses has exhibited structural validity and factorial invariance across groups and over time [30], [31]. PFAI scores have shown sound psychometric properties, including factorial invariance across groups and over time, internal consistency, external validity, predictive validity, differential stability, and latent mean stability [30], [31], [32].

Usually, changes in affective state are associated with physiological responses such as changes in heart rate, respiration, temperature and perspiration [33]. The emotion mouse, an example of recent advances in affective computing, measures the user's skin temperature, galvanic skin response (GSR) and heart rate, and uses this data to categorize the user's emotional state [34]. By simply touching a computer input device, such as a mouse, the computer system is designed to be able to determine a person's emotional state.

Preferably, evidence from many modes of interaction should be combined by a computer system so that it can generate as valid hypotheses as possible about users' emotions. The data form the PFAI and the data from the emotion mouse could be combined for a probabilistic assessment of fear at the beginning of student's interaction with the self-assessment system, helping the system to decide in advance how to treat the student. We propose that probabilistic assessment of fear should also continue during student's interaction with the self-assessment system, in order to provide the system with real time measurement of student's fear. This could be achieved by taking data from the emotion mouse and by asking students to rate their fear at certain points during the test.

After the end of their interaction with the system, students could be notified about their fear level and given useful information and helpful advice about how to cope with this problem. Talking about fear of failure before exams as a common problem, could help students to rationalise their fear and manage to accomplish an adequate preparation for the test.

We assume that an effective way to enhance self-confidence is to formulate questions to which the student would be capable of providing the right answer. To do so, we need to evaluate student's knowledge just before the test. For that

purpose, the self-assessment system would ask the student to answer some questions in advance, without notifying him about his record. Thus, the system could assess which kind of questions the student is more likely to answer correctly, and present to him such kind of questions in order to increase student's self confidence and prevent fear. The system could also assess to which kind of questions the student is best at, judging from his past tests which could be kept in a secure data base.

Using this method, the system could also assess about which kind of questions the student is unlikely to answer. Thus, it could ask this kind of questions at an appropriate time during the test, for example, after the student has answered correctly a number of questions. Then, in case of wrong answer, the computer could provide the student with sufficient explanation about the correct answer and with emotional feedback so as to prevent fear. Under this sequence, the kind of questions the student is weak at could be asked over and over, until the student manages to achieve a satisfactory level of success (Fig. 1).

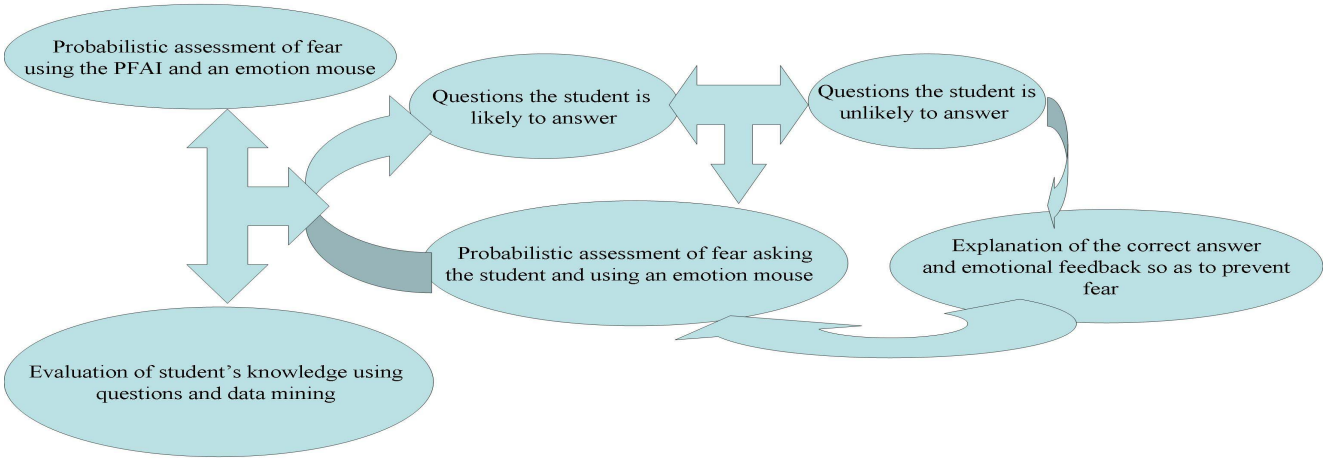

Fig. 1 A self-assessment system to reduce fear of failure

V. Conclusion

Feeling fear before or during an examination is normal and it can, in certain limits, strengthen the student's performance. If before or during a test the student's level of fear is above the proper level, he may also fail to demonstrate his true abilities. Fear of failure refers to the motivation to avoid failure because of the possibility of experiencing shame or embarrassment, personal distrust around mastering a topic, and/or panic over the possibility of failing. Fear of failure often accompanies low self-efficacy. In some students, self-defeating beliefs, and a fear of failure had a strong association with eventual exam failure, the very situation that they were trying to avoid.

Moreover, there is research evidence that computerized tests may cause fear and anxiety in some people. Users with high task confidence might actually perform less well when working with adaptive software, since they would fear of the tasks getting increasingly complex because of the user's own anticipated high initial performance. Thus, they might eventually lead to an actual decrease in performance. On the other hand, low task confidence participants, should perform better when working with adaptive software, because they might expect the adaptation function to assist them. Since they expect to perform weakly, they could also assume that the software will present them simpler tasks as the test progresses. Thus, their stress is decreased and this should lead to higher performance during adaptive testing than during non-adaptive testing.

The same situation may be regarded as stressful by one individual, but not stressful by another. This is indicative of the fact that it is an individual's view and interpretation of demands placed upon him that causes the individual to fail, not the demands themselves. We propose helping the individual to handle negative expectations when preparing for exams through a self-assessment system.

It can be supported, that in order to call somebody's consciousness it is enough to address him a question with regards to his feelings. Feelings are always admitted by a conscious being. Therefore, we make the assumption that just asking the student, during the test, to express the level of his fear, activates his consciousness, making it more possible for him to prevail over his fear.

In addition, positive feedback can influence and improve low self-esteem students in believing that they can accomplish and learn from the subject material that they feared the most. Increased self-efficacy can increase

individuals' resistance to negative emotions like anxiety, distress and even fear.

Economides proposed an emotional feedback framework, taking as field of application the CAT systems, in order to manage emotions (including fear). Moreover, the FEASP approach proposes four tactics in order to reduce fear during learning, which could be also implemented to a self-assessment system.

We propose a self-assessment system in order to reduce students' fear of failure and improve their knowledge during preparation for exams. For that purpose, the system would formulate a probabilistic assessment of students' fear in advance, using the PFAI and an emotion mouse. Students' knowledge would be also evaluated in advance using questions and data mining, so that the system would infer about student's cognitive strengths and weaknesses. Moreover, probabilistic assessment of students' fear would continue during students' interaction with the system, asking the student and using the emotion mouse. The system would first address questions that the student is more likely to answer correctly in order to enhance his self-confidence, and then would ask questions that may reveal student's weaknesses. In case of wrong answer, the computer could provide the student with sufficient explanation about the correct answer and with emotional feedback so as to prevent fear. Under this sequence, the kind of questions the student is weak at could be asked over and over, until the student manages to achieve a satisfactory level of success. After the end of their interaction with the system, students could be notified about their fear level and given useful information and helpful advice about how to cope with this problem. Currently, we are developing a computerized adaptive self-assessment system incorporating the ideas of this paper.

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