Can relaxation exercises improve learning?

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Abstract. Students use both domain-dependent strategies (such as seeking specific domain help) and domain-independent strategies (such as relaxation exercises) to help regulate their affective states when learning. This paper reports a study that compared students' performance in learning data-structures across two systems. While both systems supported domain-dependent strategies, one additionally supported domain-independent strategies (relaxation exercises). The results provide some evidence that students working with both domain-dependent and domain-independent strategies performed better than those working with domain-dependent strategies only.

Keywords. Emotions, Affective tutoring system, Domain-independent strategies

Introduction

Emotions mediated by appropriate attention, self-regulation and motivation strategies have a positive effect on learning and achievement and there is growing concern for the vital role of affect in education [1]. However, the techniques for helping students regulate their emotions employed by current affective tutoring systems do not take proper account of normal emotion regulation strategies. Empirical studies [see e.g. 2,3] provide strong evidence that individuals use both domain-dependent strategies (such as seeking specific help) and domain-independent strategies (such as seeking to relax) to regulate or modulate any overly intense affective state. By contrast, current affective ITS systems [see e.g. 4,5] concentrate very largely on the use of domain-dependent strategies only. In this paper, we describe an experimental study which investigated the effect on students' learning performance of a relaxation exercise and positive affirmation (two domain-independent strategies) using for affective tutoring involving two stages of affective appraisal proposed in [6].

1. The effects of relaxation exercises and positive affirmation

There were two versions of a system to teach data-structures in an undergraduate course in this between-subjects experiment. The domain-dependent (DD) version provided a certain amount of adaptive help to each student. The DD+DI (domain independent) version provided the same domain level adaptive help as the DD version

but also required students to undertake relaxation exercises and positive affirmation, i.e. motivating statements to the student about their performance. In total 31 (18 Male and 14 Females) participants worked with the DD version and 33 participants (21 Male and 12 Females) worked with the DD + DI version. Participants were divided *post hoc* by ability based on their pre-test data-structure scores because we were interested in any interaction of ability with the domain-independent strategies.

Pre-and post-tests and learning materials were derived from a question bank for a course on Data Structures at the University of Tenaga Nasional. The relaxation exercise was a shorter version of Jacobson's and Benson's relaxation techniques [7] which concentrated on the upper limbs only. The experimental stages are shown in Figure 1.



Figure 1: The experimental design flowchart

2. Results

The participants using DD+DI version registered a 31.6% learning gain between pre- and post-test as compared to 19.5% learning gain for those using the DD version (Figure 2). This difference is significant (p <0.05). The participants' learning gains was further classified according to their ability (Figure 3). The low ability students using the DD+DI version registered a higher learning gain of 33.5% as compared to 20.7% for the low ability students using the DD version. This difference was significant (p <0.05). The difference in learning gain for high ability students using the DD+DI version compared to the high ability students using the DD version was not significant.

The course consisted of four lessons (L1-L4) and the number who completed each lesson correctly within the given time limit was noted. A higher percentage of students using the DD+DI version completed their lessons successfully (see Table 1).



Table 1: Percentage of students who completed their lessons successfully

Ability	Group	L1	L2	L3	L 4	Average	
		%	%	%	%	%	Significant
Low	DD (23)	39.13	30.43	34.78	8.70	28.26	
	DD+DI (18)	44.44	61.11	61.11	27.78	48.61	Ν
High	DD (8)	87.50	50.00	37.50	37.50	53.13	
	DD+DI(15)	73.30	60.00	60.00	60.00	63.33	Ν
All	DD(31)	51.61	35.48	35.48	16.13	34.68	
students	DD+DI(33)	57.68	60.61	60.45	45.45	56.06	Y

3. Conclusion

We have briefly described an experiment where two versions of a system to teach data structures were compared. With the same time on task, the systems differed only in the inclusion of domain-independent strategies to assist the students manage their emotions in one version of the system. The additional use of domain-independent strategies (relaxation exercise and positive affirmation) improved students' performance and in particular that of the low ability students.

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