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THE EFFECTS OF OLFACTORY STIMULI ON SCHOLASTIC PERFORMANCE

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The research described in this paper was carried out to determine the effects of olfactory stimuli (provided by natural essence oils of lemon) on achievement in English of fourth grade pupils in a school in Turkey. Pupils were randomly assigned to an experimental group (n:29) or a control group (n:29). Both groups were taught English lessons twice a week for a period of four weeks as part of the normal curriculum. In the experimental group, lessons were provided in an aromatic atmosphere. In the control group, lessons were provided in a normal classroom environment. Following treatment, the experimental group outperformed the control group on an achievement test in English. A month after the termination of treatment, the performance of both groups on the achievement test had deteriorated, but the experimental group still outperformed the control group.

While the fortunes of the senses have changed over time in the study of perception (Classen, 1998; Hewes, 2002), auditory and visual senses and materials have been awarded much greater attention. This is perhaps because the audio-visual senses have traditionally been considered 'high' and other senses 'low', a view reinforced by inventions such as the camera, cinema, the telescope, and television in the 19th and 20th centuries. During this period, which has been associated with the rise of visual culture, other senses have been neglected. In fact, the visual sense can be considered to have usurped the roles of other senses, and the olfactory sense in particular was sacrificed (Howes, 2002). In this situation, it is not surprising that, compared to research involving auditory and visual senses, researches on the olfactory sense have been few and far between (Bodnar, Corbett, & Nekrasovski, 2004).

Today, however, there is increasing recognition that if we accept that education is a holistic process designed to assist all students reach their potential, learning experiences should be multi-sensory (Covey, 2005) and that learning materials should address not only the auditory and visual senses, but other ways of knowing as well (Caine & Caine, 2002). It may be hoped that sensual diversity in learning should lead to better learning (Ozyurt & Girgin, 2000): since the stimuli and messages that surround us include data for all the senses, a learning approach that involves all the senses should result in better outcomes.

There is evidence to support the view that olfactory stimuli support audio-visual stimuli and have positive effects on attention, perception, memory, communication skills, language acquisition, and mood (Aoyoama, 2004; Ceccarelli, Lariviere, Fiorenzani, Sacerdote, & Aloisi, 2003; Köster, 2002; Moss, Cook, Wesney, & Duckett, 2002; Sprinkle, 1999; Tildesley, Kennedy, Perry, Ballard, Wesnes, & Scholey, 2005). This may be because olfactory stimuli have a unifying and co-ordinating role in connecting audio-visual stimuli with emotions (Broughan, 2002) or because different senses produce different 'takes'on the same phenomena (Porteous, 1990).

The study described in this paper focused on the role of olfactory stimuli in the sensual enrichment of learning environments. The learning environment of a group of fourth grade pupils was enhanced by the provision of lemon aroma during English lessons for a period of four weeks, following which their performance was compared with the performance of a control group which had a similar initial level of achievement.

METHOD

In the spring term of the 2004-05 school year, 58 pupils in a primary school in Elazig, Turkey were randomly assigned to either an experimental or a control group (29 to each group). The mean of the experimental group on a test of English language was 5.96 (SD: 1.68); the mean of the control group was 5.90 (SD: 1.59), scores which do not differ significantly.

Both groups were taught English twice a week (for two periods of 40 minutes) as part of the normal primary school schedule. Audio-visual stimuli (cassette player, visual charts, textbooks etc) were used. In the experimental group, but not in the control group, a lemon aroma was provided by an electrical vaporizer during lessons for a period of four weeks.

Pupils in both groups were administered a specially constructed test of English based on the fourth grade curriculum. The 20-item test had a mean difficulty level of .53 and a KR20 reliability coefficient of .81. The test was administered before treatment began, on termination of treatment, and one month after termination.

RESULTS

Following treatment, the mean score of the experimental group on the English achievement test was significantly higher than the mean score of the control group (Table 1).

A month following the termination of treatment, although both groups performed less well than when assessed at the end of the treatment, the performance of the experimental group was still significantly better than the performance of the control group (Table 2).

Table 1
Post-Treatment Means (and SDs) of Experimental and Control Groups on Achievement Test in English

	N	M	SD
Experimental	29	6.62	1.92
Control	29	5.07	1.39

$t = 3.53$; $p = .001$

Table 2
Post-Treatment Means (and SDs) of Experimental and Control Groups on Achievement Test in English One Month After Termination of Treatment

	N	M	SD
Experimental	29	5.86	1.99
Control	29	4.14	1.99

$t = 3.63$; $p = .001$

CONCLUSION

The use of lemon essence oil aroma as an olfactory stimulus was found to be associated with improved achievement. Furthermore, the retention rate of pupils who had been exposed to the stimulus exceeded that of a control group.

In general, the results support the findings of other investigations of the effects of various aromas on scholastic performance (Ceccarelli et al., 2003; Field et al., 2005; Tildesley et al, 2005). While the precise mechanism through which this works is far from clear, it does support the view that learning in a multi-sensory environment advantages students.

It should be acknowledged that the results of this study cannot automatically be generalized to other situations since the senses are constructed and lived differently in different societies (Howes, 2005).

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