

New possibilities of noise reduction in classrooms

Educational noise control lights and acoustic edge absorbers

The noise in kindergartens and schools often has been the subject of scientific and practical concern. But as long as noise does not undergo a similar evaluation as mould in walls or static building defects, then what is absolutely necessary, will not be achieved. Tiled departmental thinking spoils huge financial resources in terms of sickness and early retirement, although it is without any doubt that prevention of noise pollution would be much cheaper and can often prevent tinnitus or burn-out.

Of course, noise abatement in educational establishments is primarily an educational mission. No technical gadget and no structural design can replace the pedagogy. Nevertheless sound absorbing ceilings and claddings and the noise-controlling units called Chatter Trackers™, especially in kindergarten and primary schools, in many cases lead to significant reduction in noise exposure of teachers and pupils. These technical supports have not yet been fully exploited. New noise controls with additional psychological functions, promise to have a further positive influence on the pupil's behaviour, and the so-called acoustic edge-absorber technology absorbs the reverberation and noise in the room at much lower cost far more sustainably than today's "acoustic ceilings".

I. Optical noise lights

Noise control lights respond to sound via a microphone, whilst an electronic system controls the LEDs of a more or less traffic-light-like display. The more the product resembles traffic lights, the easier one may illustrate the principle even to young children: RED is forbidden - GREEN is allowed and YELLOW calls for attention regarding the noise in the room. Noise lights, in different forms are priced without data logger from 79 to 329 €, with the most expensive unit cost data loggers over 700 €. However, noise data loggers are useful only for scientific research.

No one up to now has sold gadgets with a numeric display of noise, showing how many times acceptable noise levels have been exceeded, which is of great interest from a behaviour psychological view. If you could see, for example, that the unit displayed RED, 30 times in one lesson, it could be helpful therefore, to reduce the number of exceeded noisy times perhaps by half - so only to 15 times RED..

This approach corresponds to the "behaviour modification" (Redlich and others 2000), a behaviour therapy based on a successful method of teaching management of student's behaviour. By quantifying realistic behavioural goals and accompanied by the success and a systematically re-register, you increase the probability of occurrence of the desired behaviour - namely to be quieter. You must not use great rewards, it is sufficient to visualise the result of the efforts and talk to the children about the success.



Picture 1: Chatter Tracker™ with digital noise counter
(Picture: B.Richter)

The Chatter Tracker™ in picture 1 (dimensions: 14 x 43 x 12 cm) is an English development. The unit displays the noise level in the classroom or nursery group as usual after the traffic light principle. Additionally it has a digital noise counter (enlarged section). Whenever the noise control shows RED the counter jumps one unit further, in picture 1, enlarged section, the chatter tracker shows 4 noise periods. The device is in the latest version of superior quality and much more sensitive than any other to be found on the European market. It is going to RED in the lowest position at about 45 dB. Therefore it is also suitable for smaller pupil frequencies in primary schools. A delay circuit prevents reaction of the counter at very short noise events – this is also not standard in other products. By pushing a button, you can set the digital counter to zero. The unit has some other functions - including a multilingual verbal invitation to the students to be quiet and an adjustable signal. It can be run with AC power or six AA-sized (rechargeable) batteries.

One step further, a noise control unit (picture 2, dimensions 26x49, 58 cm) comes with an educational protocol function. This German developed unit displays the noise level in the classroom as usual after the traffic light principle. Right has the unit two LED strips with green and red points of light. If it is quiet in the classroom, it shows after one minute GREEN a green point of reward. The "rest interval" is up to six minutes. Skip the traffic noise several times to red, the unit shows a "penalty" red point. You can set how often the traffic light has to jump to red to receive a red-point "penalty". This is set once to six times. At the end of the lesson, it is possible to discuss the noise and behaviour assessed by pupils themselves. In this connection may be defined with the students behavioural goals and re-adjust the full course of instruction, as is standard in the classic behaviour modification. You may run the unit with AC power or chargeble micro-batteries. The device is in the model of 2012 of low sensitivity; it is going to RED at about 75 dB or more. It is therefore not suitable for primary schools.



Picture 2: Noise control with pedagogical protocol function
(Picture: B.Richter)

II. Acoustic edge absorbers

Fibrous or porous and other sound absorbing materials are commonly employed on large surfaces in the form of suspended ceilings and wall claddings. Fuchs et al. (2012) were, however, able to show that the low-frequency reverberation in the room inevitably produces a roar that masks the most important higher frequencies, thus affecting the intelligibility and clarity of speech and, as a result, the noise must increase considerably.



Picture 4: Acoustic edge absorbers in the washrooms of a kindergarten in SOS-Kinderdorf Berlin (Picture: SOS-Kinderdorf Berlin-Moabit)

A solution is provided by broadband bass absorber elements, to be mounted only at a few edges of the room. Acoustic edge-absorbers with a cross section of 40 x 50 cm covering only an area of less than 20% of the base area of the room, are installed horizontally or vertically. This can half the reverberation time down to 63 Hz. Lighting, ventilation and other installations can be perfectly integrated into the very easily mounted edge absorbers. With these innovative construction elements it was possible to acoustically revalue a cafeteria in the vaulted basement of a school (picture 3). That could not be achieved by conventional means, a suspended ceiling not being feasible in this situation. Edge absorbers have also been installed as benches in the lower edges of a restaurant.

Fuchs illustrates the different room-acoustical situations with many descriptive pictures. So one can gain a good idea of what is possible with this inexpensive and simple method of acoustic conditioning. The Picture 4 shows the absorber modules e.g. in washrooms tiled all around. The results are published and thoroughly explained so convincingly, that parent representatives and principals find strong arguments against statements of the school administration, that acoustic renovations of classrooms, the teachers and parents consulting rooms - or even the hallways and recreation halls would be much too expensive.



Picture 3: Acoustic absorbers installed at the edges of the vaulted ceilings in a cafeteria of a primary school (Picture: SOS-Kinderdorf Berlin-Moabit)

Summary

The efforts get power in reducing the noise levels in schools and day care centers. There are new noise lights with additional quantitative indication of the noise. And there are structural possibilities of noise reduction by innovative acoustic edge absorbers. Noise lights are not expensive. They are usually paid out of the school budget. The costs of an acoustic renovation of a classroom are less than 50 € per m² of the base area of the room. The effort against noise is absolutely necessary, because too many teachers become ill by the noise to which they are exposed several hours a day - or, at worst, even retire early. The resulting funds would be much better invested in low-cost and highly effective preventive options, as described above.

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