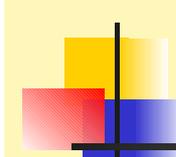


Noise Protection in the Classroom

Strategies against
noise in school



Noise Protection in the Classroom at HPG

- A development project within the structure of the sustainability management at Hulda-Pankok-Gesamtschule, Düsseldorf

Noise Protection in the Classroom at HPG

Schüler sind so laut wie Lastwagen

Als zweite Schule Düsseldorfs peilt die Hulda-Pankok-Gesamtschule ein Ökoaudit an. Dazu wird nicht nur Müll und Energie gespart, sondern es soll auch leiser werden.

Von Angela Everts

In der Turnhalle herrscht ohrenbetäubender Lärm. Alle schreien durcheinander. Dass jemand mit einem Mikrophon daneben steht, wird kaum wahrgenommen. Die Klasse 9/2 der Hulda-Pankok-Gesamtschule ist rassistisch dem Schallarm auf der Spur und durchkämmt nicht nur die Klassenräume, sondern auch die Pausenhalle, die Mensa, das Lehrerzimmer - und die Turnhalle.

Die Geräuschkurve beim Turnen ist immens, der Mittelwert spielt sich bei 85 Dezibel ein, was vergleichbar ist mit einer Lastwagen-geschleife im Stadtverkehr. Am stillsten sind die Kleinen: In der fünften Klasse werden im Unterricht 60 Dezibel gemessen.

In der achten Klasse rumscht der durchschnittliche Schallpegel auf fast 70 Dezibel hoch, um in den oberen Klassen wieder zu sinken. Nun sind die Schüler nicht aus reinem Jux mit den Messgeräten unterwegs. Die Auswertungen sollen seriös machen für die, was sich die Kinder antun. Parallel zu den Schallmessungen gab es Tests bei Stille und bei lauter Musik. Die Erkenntnis: Wer bei Rockmusik arbeitet, macht bis zu 90 Prozent mehr Schüler.

Die Beschäftigung mit dem Schallarm ist nur ein Teil der Vorarbeiten zum Ökoaudit. Hulda-Pankok will sich als zweite Düsseldorfer Schule nach der Gärthaler Fritz-Henkel-Schule ihr Umweltbewusstsein offiziell bestätigen lassen. Ein erster Schritt auf dem Weg zu diesem



Mit dem Messgerät auf Lärmjagd: Schüler der Hulda-Pankok-Schule

Fotos (2): Bernd Nanninga

Ziel ist schon getan: Die Energie-spargruppe hat für die Winter-monate die Pufferfenster verriegelt. Auf dass die Wärme nicht wie bisher dochtaßlich zum Fenster hinausfliegt. Auch gibt es künftig für fünfe Klassen einen Projekt-

tag, an dem sie den Schulumüll sortieren müssen. Nun stehen gute Absichten für ein Ökoaudit kaum aus. Ohne Unterstützung, was außen - in diesem Fall von der Firma Henkel - bliebe alles in den Ansätzen

stecken. Denn Henkel stellt die Messgeräte zur Verfügung und sorgt für die Auswertung der Daten. Die Henkeltechniker sorgen außerdem dafür, dass im Dezember der neue Interstratum eingeweiht werden kann.

62, 28.11.00

- **2001** – Pupils in year 10 measured noise exposure in the school during physics lessons. This is because the old building was found to be **extremely loud and noisy!**

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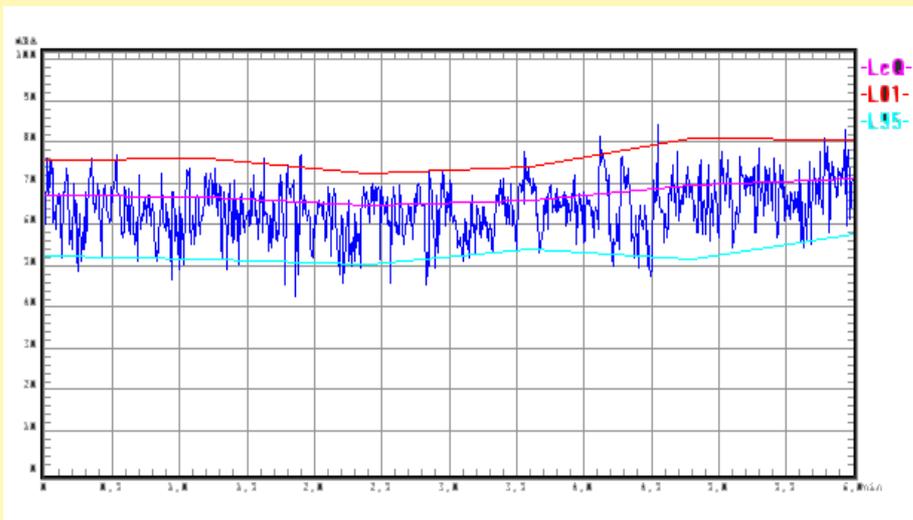
- For this, mobile apparatus was used, which uses software to generate graphs on a computer using the collected information.

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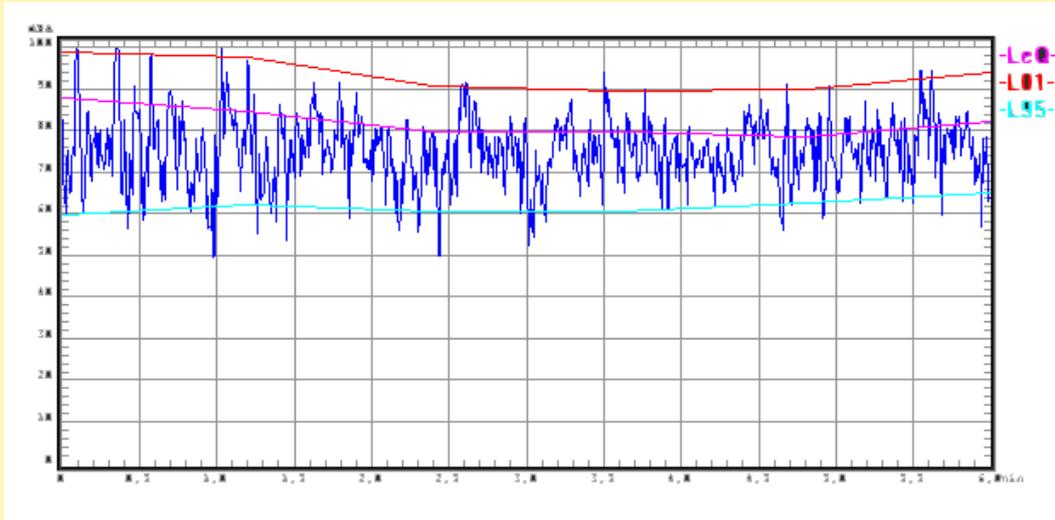
- The pupils brought the data from classrooms, hallways, gym and school yard into the „noise lab“ where the data were analysed with the help of computers and graphs were generated.

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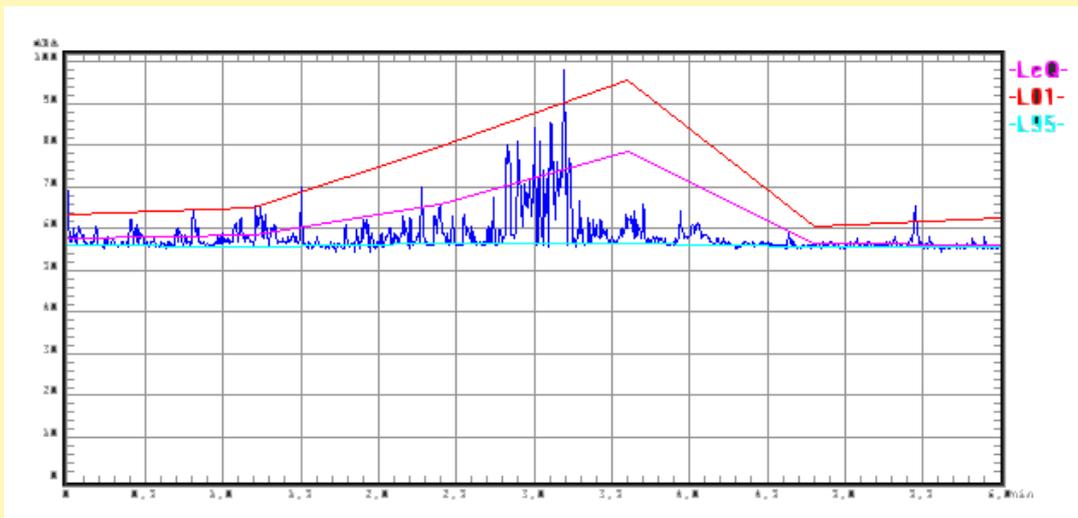
A lesson in a classroom

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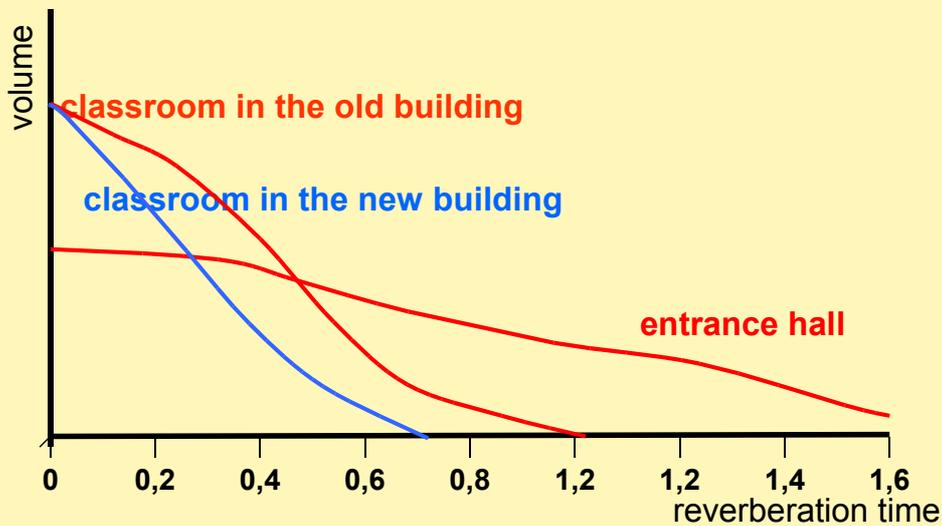
A lesson in the sports hall

Noise Protection in the Classroom at HPG



Conditions in the school wood

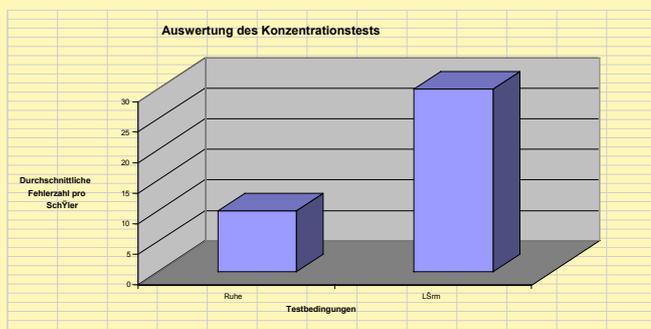
Reverberation time



classroom in the old building, unrenovated, reverberant

classroom in the new building fitted with noise absorbing structural panels

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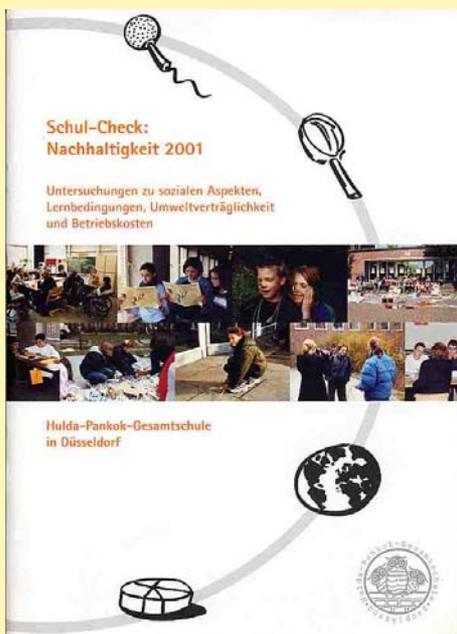


- Especially interesting, the results of subsequent focus tests of quiet and loud music: a distinctly higher number of error counts during louder music!
- Noise disturbs an important condition of learning!

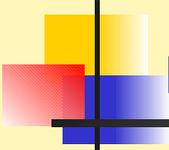
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- The conclusion that silence is best was reached, even though the pupils knew the aim of the test and wanted to influence the results towards the idea that music does not disturb them...!
- Consequences for the pupils: the pupils enjoyed the experience so much that they wanted other pupils to also experience it.

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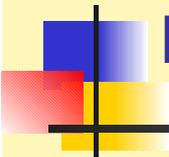
- The school bodies discussed these results (and others) in 2002, which led to ...
- ...a reform programme (data, assessment, goals, measures and responsibility), which was published in **2003**



Noise Protection in the Classroom at HPG



- The pupils who carried out the first measurements frequently publicly presented the project.
- The interest in this topic is just as high amongst the teachers and the pupils.



Focus Tests in Lessons

A theme of remedial teaching
“Learning to Learn”

Noise Protection in the Classroom at HPG

- In 2004 the execution of the sustainability programme began...
- The application of the focus tests seems to be useful for the school within the framework of the newly implemented subject independent remedial teaching (“Learning to Learn”).

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- The remedial course was interested in the topic of listening to music whilst preparing homework
- The pupils' hypothesis was: music doesn't disturb!
- This hypothesis was tested in the next step.

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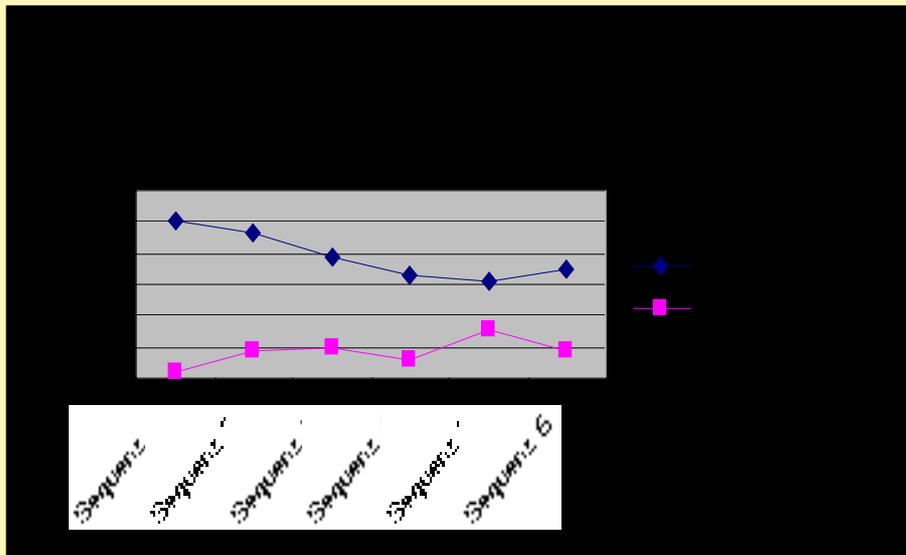
- With an MP3 player attached to the amplifier equipment, one can produce a loud sound, which will fall on everyone's ears.
- Test composition: copying texts in 5 sequences, each of 2 minutes, of ever increasing music loudness.

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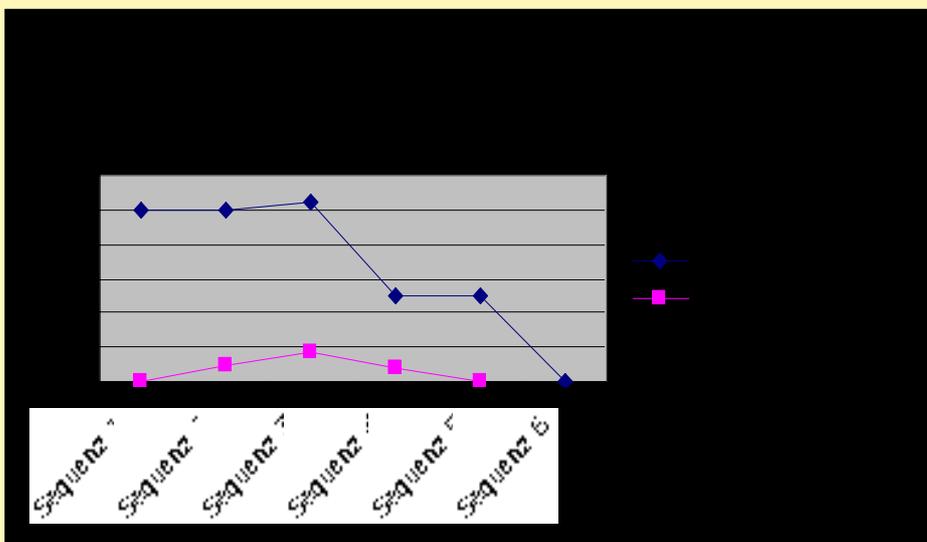
Daten: Anzahl abgeschrieben Wörter, Fehler, Prozentzahl

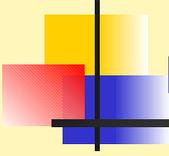
	Vanessa		Jessica		Deniz		Ninja		Madita	
Stille, keine Musik	26	1	22	0			24	5	25	0
	100%	3,8%	100%	0%			100%	20,8%	100%	0%
leise klassische Musik 65 dbA	24	4					22,5	6		
	92,3%	16,6%					93,7%	26,6%		
mittelmäßig laute Bluesmusik 75 dbA	20	4	23	4			19	4	29	0
	76,9%	20%	104,5%	17,4%			79,2%	21,1%	116%	0%
laute Hip Hop-Musik 85 dbA	17	2	12	1	22	8	18	11	24	1
	65,3%	11,8%	50%	8,3%	115%	36,4%	75%	61,1%	96%	4,2%
sehr lauter Punk-Rock 100 dbA	16	5	12	0	48	12	12	4	23	1
	61,5%	31,3%	50%	0%	252%	25%	50%	33,3%	92%	4,3%
mittelmäßig laute Country-Musik 85 dbA	18	3	Nicht mehr mitgeschrieben		42	13	16	14	35	0
	69,2%	16,7%			221%	31%	66,7%	87,5%	140%	0%

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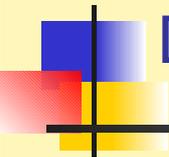
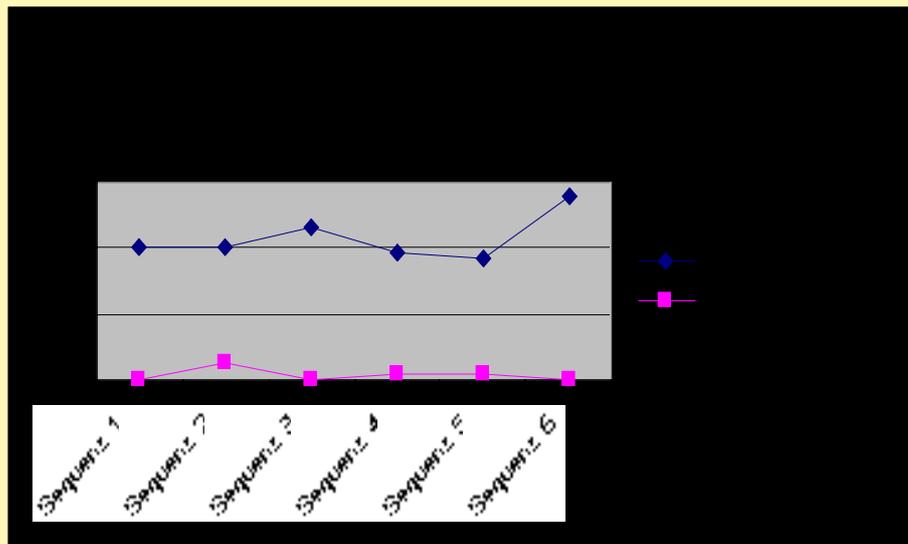


Noise Protection in the Classroom at HPG



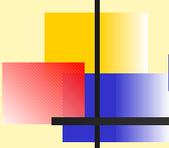


Noise Protection in the Classroom at HPG



Development of Noise Protection

Subject-independent technical support for noise prevention



Noise Protection in the Classroom at HPG

- Noise measurements in lessons- how accurate? This was discussed with the pupils.
- A class was chosen to be the pilot class.
- Initially, the noise level in various lessons of one class were measured again and saved.
- The pupils saw the graphs together with information about health dangers and the limiting value of the noise protection act to see.



Noise Protection in the Classroom at HPG

- The analysis of the pupil's research resulted in:
 - Noise is harmful.
 - Noise levels must be reduced.
 - We need a measurer and a signal giver working independent of individual impressions.
 - Teachers need not, and should not keep shouting!
 - The measuring apparatus must be adjustable for different class situations.

Noise Protection in the Classroom at HPG



- Pilot batch with the 1st prototype of our noise analysis (Lärmampel)
- Sensors and measuring cells are combined with a computer and signaller
- A quiet gong sounds when the appointed values are violated.

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- 1st lesson: pupils and the teacher agreed that it was a less noisy lesson.
- 170 violations of 70 decibels = 3.3 times a minute!

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- 2nd lesson: a work hour, in which the pupils did groupwork
- 396 violations of 70 decibels = 8.3 times a minute!

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- 3rd lesson: an undertaking of silent work, it was deadly silent!
- Only now could we hear noise which occurs beneath the level of speaking: coughing, clearing of throats, the movement of chairs, pen rattling etc

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- Prototype 2 of our Noise analysis apparatus (Lärmampel) now uses optical signalling:

red = a violation of limits
green = underneath the given value

Noise Protection in the Classroom at HPG - Perspectives Technology, testing procedure, rules, introduction

- Technical further development of the "Lärmampel" for the start of production (establishment of a pupil created company)
- Trialling further test arrangements of the impacts of noise on learning.
- Development of particular behavioural arrangements orientated to noise in the classroom.
- Testing the stipulated rules (are they viable in everyday life?)
- Consultation processes in the school bodies to the adoption of noise protection in school.
- Talks with sponsors, the school administration and local politicians.

Noise Protection in the Classroom at HPG

Project continuation
2005 and 2006

Additional project with the pilot class

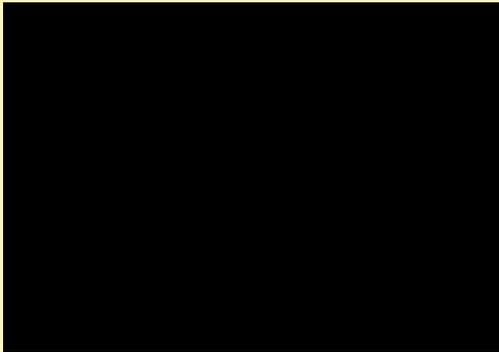


- The class further engaged themselves with additional aspects of the topic. Here, with noise mapping in the neighbourhood on the occasion of “Day against noise” 20/04/05 in Düsseldorf.

Individual orientated measures



With the help of the so-called “bugs” the noise emissions, in terms of individuals, over portions of and also the whole of a working day



Public presentation / further education



- The interim results of the development were again presented publicly by teachers and pupils, for example to 80 teachers from Düsseldorf schools on 19/04/05

Supervision / sponsors



- A visit from representatives of the school ministry, state government, resp. the telephone company Telekom in the school
- The school uses the chance – the pilot class presented the results of the noise project.

Local affairs and administration

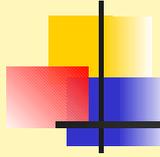


- On Tuesday, 29/08/06 the school presented the project at the school committee of the state capital, Düsseldorf.



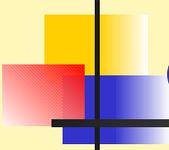
Noise in School

Recommendations



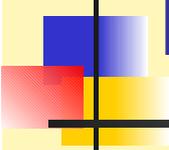
Conclusions for room acoustics

- Maximum background noise level for intellectual activity → 55 decibels
 - Recommended max. background noise level for the learning of a language → 45 decibels
 - Acoustic quality of voice signals → 10 decibels over the background noise level
 - Echoing → max. 0.55 a sec. for a medium sized classroom (52 m²); recommended 0.45 a sec.
- = Good “listening ability” in the classroom (approx. 2,500 Euros redevelopment costs per room)



Conclusions for teachers

- Noise and its impact on learning should be made a lesson topic.
- The non independent impressions of the pupils were followed by measurements and on these independent judgements can be based.
- Causes and effects of self made noise should be analysed and evaluated.
- The recommended learning arrangements allowed the pupils to do the practical research themselves, but we also made decisions democratically (e.g. establishment of class rules)



Noise in School

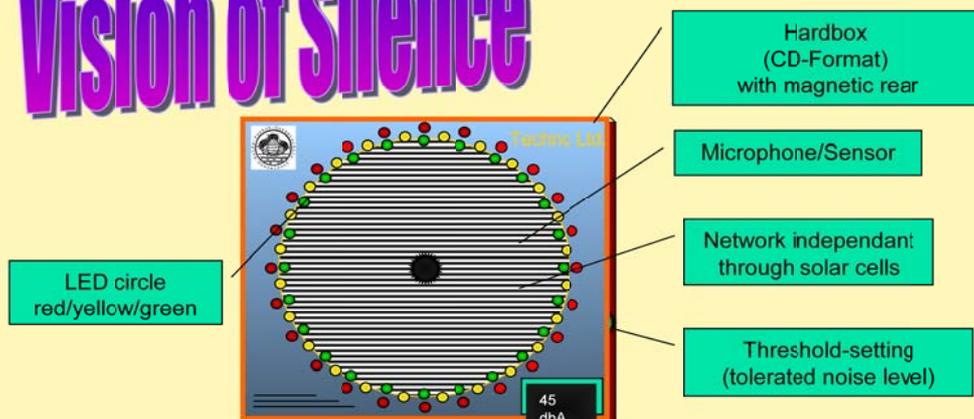
The pupil led company

Project status Schülerfirma

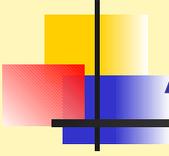
Customer survey	Completed
Lärmampel development	Carried out
Securing sponsorships	Letters being finished
Financial budget	Being discussed
Utility model registration	Took place
Documentation	In construction
Internal organisation	In construction

The Lärmampel

Vision of Silence



Appliance for visualising
of a school class in less



About us

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plus

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Düsseldorf, 22nd August 2006