A PRELIMINARY SURVEY OF NOISE LEVELS IN UK SECONDARY SCHOOLS

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Identifying a sound environment for secondary schools

Outline

• Background
• Overview of pilot study
• Results
• Factors affecting lesson noise levels
• Conclusions and further work
Background

• Noise and poor acoustics have a detrimental effect upon teaching, learning and teachers’ health.

• Far less is known about the acoustic quality of secondary schools and the impact of noise and poor acoustics upon children of secondary school age (11-18 years old).

• A research project is currently being undertaken which aims to investigate the current acoustic environment and its effect on pupils and teachers in secondary schools in the UK.
Identifying a sound environment for secondary schools (ISESS)

• Noise and acoustic surveys of secondary schools.

• Questionnaire surveys of pupils and teachers.

• Cognitive testing of pupils in various noise and acoustic conditions.

• Measurement of other environmental parameters in classrooms.
Overview of pilot study

<table>
<thead>
<tr>
<th>School</th>
<th>Gender</th>
<th>Age range</th>
<th>No. of pupils</th>
<th>Dates of building</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Female (mixed 6th form)</td>
<td>11-18</td>
<td>1000</td>
<td>1940 - 2009</td>
</tr>
<tr>
<td>2</td>
<td>Mixed</td>
<td>11-16</td>
<td>1100</td>
<td>1950 - 2000</td>
</tr>
<tr>
<td>3</td>
<td>Mixed</td>
<td>11-18</td>
<td>1000</td>
<td>1960 - 1990</td>
</tr>
<tr>
<td>4</td>
<td>Mixed</td>
<td>11-16</td>
<td>500</td>
<td>1960</td>
</tr>
</tbody>
</table>

- Suburban locations.
- None were affected by significant levels of environmental noise, such as road traffic or aircraft noise.
Overview of pilot study

- Maths
- English
- Science
- Design and Technology
- PE (Physical Education)

- 21 classrooms surveyed
- 76 lessons measured and observed
Overview of pilot study

- Norsonics N140 sound analyser
- Measurement height = 1.2m

- Indoor ambient noise level (unoccupied)
- Lesson noise level (occupied)
- Reverberation time (unoccupied)
- STI (unoccupied)

- Lesson activities
- Other factors, room volume, number of pupils, age of pupils, time of day etc
Overview of pilot study

- Norsonics N140 sound analyser
- Measurement height = 1.2m

- Indoor ambient noise level (unoccupied)
- Lesson noise level (occupied)
- Reverberation time (unoccupied)
- STI (unoccupied)

- Lesson activities
- Other factors, room volume, number of pupils, age of pupils, time of day etc
Identifying a sound environment for secondary schools

Noise level results
Indoor ambient noise level (unoccupied)

- Maths
- English
- Science
- Design and Technology
- PE

dB LAeq

School 1  School 2  School 3  School 4
Indoor ambient noise level (unoccupied)

![Bar chart showing indoor ambient noise levels for different subjects and schools.](chart.png)
Indoor ambient noise level (unoccupied)

- Maths
- English
- Science
- Design and Technology
- PE

Schools:
- School 1
- School 2
- School 3
- School 4

dB LAeq

School 1 School 2 School 3 School 4

Maths English Science Design and Technology

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ww1.lsbu.ac.uk/ISESS
Lesson Noise Level (occupied)

• Lesson noise level is the average noise level generated by the dominant activity of the lesson.

• Excluding any activities unrelated to the lesson itself, such as pupils entering or leaving the classroom.

• Made at a location in the room chosen to minimise disruption to teaching.
Average Lesson Noise (occupied) (dB LA_{eq})

<table>
<thead>
<tr>
<th>Subject</th>
<th>School 1</th>
<th>School 2</th>
<th>School 3</th>
<th>School 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maths</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design and Technology</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

School 1  School 2  School 3  School 4
Lesson activities

- 20 activities
- 6 categories

### Activity

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Individual work</td>
</tr>
<tr>
<td>2</td>
<td>Instruction/Discussion</td>
</tr>
<tr>
<td>3</td>
<td>Group Work</td>
</tr>
<tr>
<td>4</td>
<td>Science experiment</td>
</tr>
<tr>
<td>5</td>
<td>Design and Technology (practical)</td>
</tr>
<tr>
<td>6</td>
<td>Sports</td>
</tr>
</tbody>
</table>

### Lesson Noise Level

- Error Bars show 95.0% CI of Mean
- Bars show Means

- Individual work: 56 (n=8)
- Instruction/Discussion: 59 (n=36)
- Group Work: 65 (n=7)
- Science experiment: 68 (n=3)
- Design and Technology (practical): 69 (n=9)
- Sports: 77 (n=13)
Factors affecting lesson noise levels

• Lesson noise levels increased with increasing indoor ambient noise level within some subject areas.

• Lesson noise levels were higher in classrooms with longer reverberation times.

• Lesson noise levels were higher in classrooms with a lower STI, and lower in rooms with a higher STI.

• The number and age of pupils in the classroom had an effect on lesson noise levels.
Indoor Ambient Noise Level (English)
Factors affecting lesson noise levels

• Lesson noise levels increased with increasing indoor ambient noise level within some subject areas.

• Lesson noise levels were higher in classrooms with longer reverberation times.

• Lesson noise levels were higher in classrooms with a lower STI, and lower in rooms with a higher STI.

• The number and age of pupils in the classroom had an effect on lesson noise levels.
Number and age of pupils

- Lesson noise levels at Key Stage 5 were lower than at Key Stages 3 and 4.

<table>
<thead>
<tr>
<th>Key Stage 3</th>
<th>11-14 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key Stage 4</td>
<td>15-16 years</td>
</tr>
<tr>
<td>Key Stage 5</td>
<td>17-18 years</td>
</tr>
</tbody>
</table>
Number and age of pupils

- Lesson noise levels at Key Stage 5 were lower than at Key Stages 3 and 4.
- As the number of pupils in a lesson increased the lesson noise levels increased.

<table>
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</tr>
<tr>
<td>Key Stage 5</td>
<td>17-18 years</td>
</tr>
</tbody>
</table>

![Bar chart showing lesson noise levels across Key Stages 3, 4, and 5]
Conclusions and further work

• Quietest lessons: Maths and English
• Noisiest lessons: PE
• Lesson noise levels influenced by the classroom activity.
  – Quietest activity: Individual work
  – Noisiest activity: Sports
  – Most common activity: Instruction/Discussion
• A number of factors appear to be related to the lesson noise level.
• Ongoing data collection in a range of schools.
• Further analysis of the relationship between room acoustics and lesson noise levels.
Acknowledgements

Thank you to the schools, pupils and teachers that took part in this pilot study.

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