

# INVESTIGATING THE IMPACT OF SURFACE TREATMENT AND INTERNALLY GENERATED NOISE ON CLASSROOM ACOUSTICS

Mir, Sabeer H<sup>1</sup>. and Abdou, Adel A<sup>2</sup>.

KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS  
Architectural Engineering Department  
[sabeer@kfupm.edu.sa](mailto:sabeer@kfupm.edu.sa)

## ABSTRACT

Optimum acoustical conditions in classrooms are essential for good listening conditions. Students with hearing difficulties and non-native listeners are greatly handicapped when the classroom acoustics are marginal or poor affecting the comprehension of delivered speech. Poor acoustical ambience affects teachers as well, talking over noisy classrooms can be exhausting to the teacher and to his or her willingness to dialogue with the students. With the evolution of new generation of classrooms referred to as 'Smart Classrooms', a large number of PC's and instructional equipment for interactive learning are integrated into the classroom. The instructional equipment generate noise that increments the existing background noise within a classroom affecting Speech Intelligibility (SI). The objective of this study is to investigate the impact of sound absorbing material treatment and the noise generated by classroom equipment on SI. The paper highlights the best sound-absorption material configurations for a typical classroom comparing the recommended layouts with simulated cases. Supported by acoustical measurements in existing conventional and computer-equipped classrooms, an acoustically optimized smart classroom is simulated under various background noise levels and the effect of the noise on acoustical indicators and SI is evaluated. The outcome of this research can be used by designers and educational establishments as design guidelines for retrofitting of existing classrooms as well as for new projects.

**Keywords:** Smart Classrooms, Classroom acoustics, Speech intelligibility, Background noise, Acoustical modeling, and Sound absorbing material.

---

<sup>1</sup> Lecturer, Architectural Engineering Department, KFUPM, Dhahran, SA.

<sup>2</sup> Assistant Professor, Architectural Engineering Department, KFUPM, Dhahran, SA.