Thesis Report

Investigating Smart Classroom Acoustics Utilizing Computer Modeling

Prepared by:

Mir Sabeer Hamid
Graduate Student & R. A. (ID # 200429)
Architectural Engineering Dept.
KFUPM, Dhahran (KSA)

Principal Advisor:

Dr. Adel A. Abdou
Asst. Professor, Architectural Engineering Dept.
KFUPM, Dhahran (KSA)

Advising Committee Members:

Dr. Ismail M. Budaiwi
Associate Professor, Architectural Engineering Dept.
KFUPM, Dhahran (KSA

Dr. Thamir Al-Rugaib
Asst. Professor, Architecture Dept.
KFUPM, Dhahran (KSA)

THESIS ABSTRACT

STUDENTS NAME: **MIR SABEER HAMID**

TITLE OF STUDY: **INVESTIGATING SMART CLASSROOM ACOUSTICS UTILIZING COMPUTER MODELING**

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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 effects 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 facilities and instructional equipment on SI. For better understanding of acoustical influencing parameters, measurements are carried out in conventional as well computer classrooms of King Fahd University of Petroleum and Minerals, Dhahran. Evaluation of measurements reveal the effects of surface finishing on sound behavior in classrooms and the Background Noise (BN) conditions existing in classrooms currently used for lecture delivery. Measuring the BN with equipment 'OFF' and 'ON' conditions assesses the effect of instructional equipment generated noise. A smart classroom model is simulated, varying the surface treatment to achieve the best overall configuration of sound absorption material characteristics and material placement. The derived best material configuration for a typical smart classroom is compared with the recommended classroom layouts to verify the effectiveness. Supported by acoustical measurements in existing conventional and computer-equipped classrooms, the acoustically optimized smart classroom is simulated under various BN levels and the impact of noise on acoustical indicators and SI is evaluated. The results clearly highlight the betterment in speech conditions with proper surface treatment at the same time, the detrimental effect of high noise environment on SI is noticed. Designers and educational establishments can use the outcome of this research as guidelines for retrofitting of existing classrooms as well as for new projects.

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