

## **Research Review of Sound Enhanced Classroom Technology.**

Nationwide studies have shown the effectiveness of this method and technology in improving the learning and instructional environments of students. Research has established direct positive correlations with the implementation of audio/sound enhancement classroom systems, and the improvement of students' (pre-Kindergarten to secondary) academic performance and test scores, regardless of their individual learning needs, socio-economic status, ethnicity, or limited English proficiency.

- 1. Instruction in audio-enhanced classrooms reversed trend of failing test scores with high need students.** School trials of audio-enhanced classrooms reversed the trend of failing achievement test scores with urban, high need students. Two years previous to the installation of audio enhancement equipment 5th Grade Stanford Achievement Test (SAT) scores showed a consistent downward trend in reading, math, language, science, social studies, and total test battery. As a result of the implementation of audio enhancement systems in 5th grade classrooms, Stanford Achievement Test scores went improved in Reading, Math, and Science, 10% to 15%. The second and third year of audio enhanced classrooms showed similar test gains of 10% improvement over the previous years. It was also found that phonemic and phonological awareness instruction coupled with the use of audio enhancement systems reduced the number of students identified as at-risk learners. (McCarty, CEFPI Paper Presentation, 2003, and BYU Department of Human Development study, 2003)
- 2. Use of sound field systems significantly improve teaching of phonemic awareness, especially with at-risk students.** Improving literacy is a national priority. Phonemic awareness is a prerequisite to successful reading and comprehension. It is an auditory skill dealing with the sounds of spoken language. This University of Akron study found the use of audio or sound field amplification to enhance the acoustic environment of schools will significantly improve and facilitate successful student development of phonemic awareness. (Flexer, University of Akron, 2002)
- 3. Sound Enhanced Classroom in Florida Middle School Improve Student Achievement in Reading & Math.** A three year study of the historical gains of middle school students taught in sound enhanced classrooms showed significantly improved student achievement among a like, cohort, group of 6<sup>th</sup> – 7<sup>th</sup> - 8<sup>th</sup> grade students. The study showed a minimum of annual gains of 11% as measured on the FCAT assessment tests. (Bernier, Odyssey Middle School, Orange County Public Schools, Florida, 2003 – BYU study)
- 4. Michigan Intermediate School Students Show 10% Increase in Student Achievement.** A minimum of 10% gains per year in student achievement was recorded, following four years of data collection after initial implementation of sound enhancement equipment installed in its intermediate school classrooms outside of Detroit, Michigan. Currently 75% (3150 rooms) of all classroom in the school district are sound enhanced. (Deborah Edwards, Office of Student

Services, Oakland Intermediate Schools, 2003 – Oakland ISD Sound Enhancement Report)

- 5. Literacy and Math Gains in Audio Enhanced Classrooms.** Multiple year study of 3<sup>rd</sup> and 4<sup>th</sup> grade student cohort showed over 15% gains in Reading, Math, Language Arts, and Spelling over three year period as measured by Stanford-9 Achievement Tests. (Boggs & McClanahan, Anaheim Public Schools, California, 2003).
- 6. Impact of audio enhancement technology on middle school students test scores and student achievement.** Ocoee Middle School, Florida, is among the first in the nation to employ a comprehensive audio enhancement system that includes built-in amplification for teacher's voices in each classroom. At 10% gain in achievement test scores were reported in the first year of audio enhancement. (Clark, Orange County Public Schools, Florida, 2002)
- 7. Contributions of the sound-field amplification systems in improving the school listening environment in Taiwan.** The purpose of this study was to evaluate the effects of the use of sound-field amplification systems in elementary schools in Taiwan. Speech recognition scores under three experimental conditions were measured. The results indicated that the recognition scores were always higher in the amplified conditions. (Chiang, National Hsinchu Teachers College, Taiwan, 2002)
- 8. Sound enhancement systems improves off-task behavior.** The purpose of this study was to determine the effect of sound enhancement systems had frequency of off-task student behavior. Classroom that used the sound enhancement systems indicated consistency in the decline of off-task behavior for all classes that used the system over classrooms that did not. (Ryan, University of West Florida, 2002)
- 9. Literacy and numeracy gains in audio-enhanced classrooms.** Anaheim Public Schools showed significant 3<sup>rd</sup> and 4<sup>th</sup> grade student test scores gain in reading, math, language, and spelling in audio-enhanced classrooms, when compared to previous years' test scores without audio enhancement intervention and implementation. Audio enhanced schools reported overall gains of 5-15%. (Anaheim Public Schools, California, 2002)
- 10. Detrimental effects of ambient noise exposure on student classroom learning environments.** Children exposed to ambient noise experience increased stress and physical health concerns. If students cannot focus on the spoken word of the teacher, they not only lose the desire but also the ability to learn. This inability to learn manifests itself in a "learned helplessness" state (Evans, Cornell University, 2002).
- 11. Limited English Language Proficient Students Improved English Mastery**

- and Learning in Audio Enhanced Classrooms – An Urban “At Risk” Elementary School Study.** This study tested classroom audio enhancement effectiveness in raising student test scores with a cohort of English Language Learners (ELL). The results showed highly significant gains in Sanford Achievement Test and Utah’s Criterion Reference Test scores with an average improvement of 16% increase. (McCarty, BYU study, 2003)
12. **Effects of Sound Enhancement on “High Achievement” Suburban Schools.** Sound enhancement made significant student academic improvement in the learning environment of students who had previously scored in the 8<sup>th</sup> and 9<sup>th</sup> stanines on Colorado Student Achievement Test (CSAP). Formal assessment student test scores increased an average of 3.6 percentage points during the first year of sound amplification intervention. A 4% percentage gain was observed in the second year of sound enhance implementation. These test score gains are significant since the baseline scores were already in the 8<sup>th</sup> & 9<sup>th</sup> stanines. (Giurado, Jefferson County Public Schools, Colorado, 2003)
  13. **The Relationship Between Vocal Fatigue and The Utilization of Sound Field Frequency Modulation Amplification.** The research indicated the use of classroom amplification is facilitative towards a more efficient voice and in turn assists in the reduction of vocal fatigue. (Johnson, University of Northern Iowa, 2001)
  14. **Students Listen Better and Follow Directions with Sound Field.** Teachers supported the use of sound field because they felt free to move about the classroom and they did not have to repeat instructions as often. This study found that a mild intermittent 15dB hearing loss could be educationally significant and could put a child “at risk” for language development and learning. Students stated that they did not have to work as hard to hear and they were not constantly looking for the teacher. (Osborn, Putnam County Educational Service Center, 2001)
  15. **Students Require Better Acoustical Environments than Adults with Normal Hearing to Achieve Equivalent Perception Scores.** The use of classroom amplification, provided with a sound field amplification system, can significantly affect speech perception for children with normal hearing. (Crandell, University of Florida in Gainesville, 2001)
  16. **Effects of Sound Field Amplification on the Speech Perception of ESL Children.** Children for whom English is a second language (ESL) exhibit greater speech perception difficulties than native English speaking children. This investigation noted that the speech perception abilities of ESL children were significantly improved with the utilization of sound field systems. (Crandell, University of Florida in Gainesville, 2000)

- 17. Hearing and Listening in a Typical Classroom.** In the typical classroom, a number of environmental and student factors interfere with listening. The use of a wireless microphone by the teacher and loudspeakers placed appropriately in the room reduced student fatigue, increased on-task student behavior, improved classroom management and decreased teacher vocal fatigue. (Palmer, University of Pittsburgh, 1999)
- 18. Why Johnny and Joanie Can't Read.** Dyslexic children cannot sound out many words for the simple reason that they have never clearly heard what sounds certain letters make. Average scores on reading tests before classrooms were amplified were 44-48%. With the same teachers, same curriculum and same student population the average score after 7 months of sound field amplification was 75%. (Uintah Public Schools, Utah Elementary School Principals Association Conference, February 1998)
- 19. Turning Up the Sound for Better Learning.** A teacher's inability to communicate with students can greatly hinder learning, especially for young children. Teachers in amplified classrooms report that students become more attentive; less distracted and require fewer repetitions of directions. This study indicates that all the first grade students benefited from electronic amplification of their teacher's voices. (Stouten, Wadena and Deer Creek Schools, 1997)
- 20. Iowa Teacher Survey on the Usefulness of Classroom Amplification Equipment.** Teachers who have the opportunity to use classroom amplification rank its usefulness above popular school visual enhancing equipment such as overhead projectors, televisions and computers. (Allen, Dubuque Iowa Public Schools, 1996)
- 21. Effects of Sound Field Amplification on Students' On-Task Behavior.** It was found that the observed students in amplified elementary school classrooms showed an average 17% increase in their overall on-task behavior. It was concluded that amplifying the teachers' voices enhanced the students' listening learning environment, which resulted in a positive effect on their on-task behavior. (Allen, Dubuque Iowa Public Schools, 1996)
- 22. Teacher Absenteeism Decline with Sound Field Amplification Usage.** Iowa teachers using sound field classroom amplification equipment found a 36% decline in teacher absenteeism when compared to teachers not using sound field amplification. Teachers' complaints and sick leave for voice, jaw or throat problems decreased dramatically for teachers who used sound field amplification systems in their classrooms over teachers who did not. The data showed an increased use of sound field amplification equipment would result in a substantial annual savings for the school district in substitute teacher pay. (Allen, Dubuque Iowa Public Schools, 1996)

**23. Spelling Performance Improvement in Audio Enhanced Classrooms.** Audio enhanced classrooms showed statistically significant improvement in spelling performance of upper grade, regular education students when compared to peers in classrooms with no audio enhancement. (Zabel & Tabor 1993)