

# Field Study News

## Dynamic SoundField: Teachers' Ratings

Students Perform Better, Classrooms are Quieter, Teacher Vocal Strain is Reduced

### Abstract

Dynamic SoundField is a new generation soundfield technology with automated settings and a specially designed loudspeaker array for even distribution of the teacher's voice in a classroom.

In this study, teachers at a primary school in New Zealand, used Dynamic SoundField in their classrooms for an average of two months. They then each completed a questionnaire of 13 targeted questions with a response rate of 100%.

The teachers reported a significant improvement in student performance when using Dynamic SoundField, their own vocal strain was reduced, it was quieter in class, the equipment was easy to use and the sound quality was highly rated. These results were indicative of high Dynamic SoundField acceptance by the teachers. The data complement the objective significant improvements in speech understanding in noise by normal hearing students, as reported in a previous edition of Field Study News.

### Introduction

A soundfield system consists of a wireless microphone and one or more loudspeakers. Soundfield systems amplify the voice of the teacher above the ambient noise and ideally sound is then evenly distributed across the room. The purpose of such a system is to make listening to the voice of the teacher easier for all children, and thereby improving learning conditions.

Dynamic SoundField is a new technology from Phonak that adapts its volume and frequency response settings automatically to the noise level in the classroom (see the Phonak brochure 'Dynamic SoundField - The technology behind the world's leading soundfield system' for a detailed description). The specially designed loudspeaker array of Dynamic SoundField— called the DigiMaster5000 – distributes sound predominantly in the horizontal plane, thereby creating less floor and ceiling reverberations than traditional soundfield systems, which usually utilize simpler loudspeaker designs such as monopole loudspeakers. Dynamic SoundField also creates less so-called 'late reverberation', which can have a detrimental effect on speech understanding.

To evaluate objective speech understanding at typical classroom noise levels, a study was conducted and the results

reported in a previous edition of Field Study News (January 2011). In noise levels of 70 dB(A) normal hearing children showed significantly better speech understanding scores with Dynamic SoundField than with competitive products based on traditional soundfield technology.

However this study focuses on the subjective evaluation of Dynamic SoundField by teachers.

### Test subjects and test method

At the newly built Wanaka Primary School ([www.wanaka.school.nz](http://www.wanaka.school.nz)) in Wanaka, New Zealand, Dynamic Soundfield systems were installed in every classroom. These Dynamic SoundField systems each consisted of one inspiro teacher transmitter with EasyBoom microphone, and one DigiMaster 5000 loudspeaker array. All 18 teachers received 30 minutes of detailed training and instruction from two Phonak product experts concerning how to use the system, while technicians and school leaders received 90 minutes of training.

Compliance was high as all teachers used their systems during every class. After two months of usage, questionnaires were sent to the 18 teachers and 18 completed questionnaires were returned, a response rate of 100%. Each questionnaire first included questions about: class size, the year of the students, and whether the teacher had used any soundfield system before. The actual evaluation portion of the questionnaire then consisted of a further nine questions concerning how their in-class use of Dynamic SoundField had affected the students, teacher and the classroom, with a final four questions related to the equipment itself.

The teachers could indicate their judgment by checking one box, with ratings spanning either from 'Worse', 'Same', 'Some improvement' to 'Significant Improvement', or from 'Poor' through 'Okay', 'Good' and 'Very Good'.

### Results

The average class size was 23.8 children, with a minimum of 12 and a maximum of 29 children in each class. The students' years varied from 0 to 5/6.

14 teachers (78%) had no previous experience of using a soundfield system, two teachers (11%) did have previous experience, and two teachers failed to

indicate their previous soundfield experience. The results of all 13 questions are presented in figures 1 through 13, in which figures 1 through 6 (blue bar graphs) show student performance, figures 7 and 8 (orange bar graphs) show teacher benefits, figure 9 (red bar graph) shows classroom noise level and figures 10 through 13 (green bar graphs) show equipment ratings. Reading and spelling skills were not rated for all student classes, as these questions were not applicable to the youngest children. One teacher did not reply to the question about the reliability of the system. All other questions were answered by all 18 teachers.

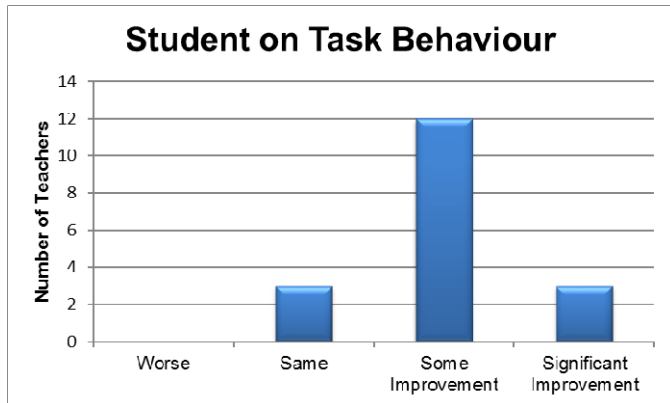


Figure 1. 12 out of 18 (67%) teachers reported some improvement in student on task behavior and three (17%) reported a significant improvement.

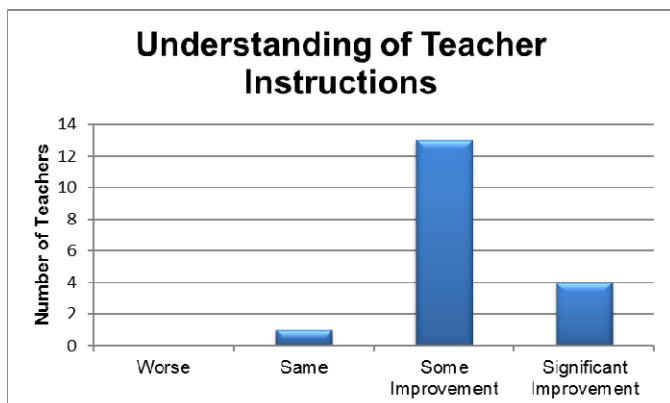


Figure 2. With the exception of one teacher, all teachers observed that students understood teacher instructions better.

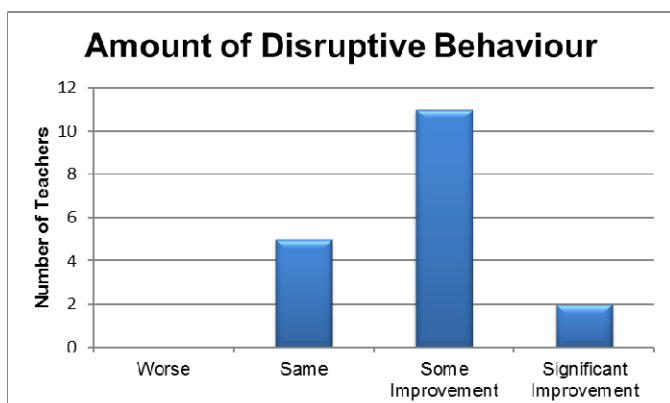


Figure 3. Overall disruptive behavior in the school decreased according to 72% of the teachers. Two teachers reported a significant improvement.

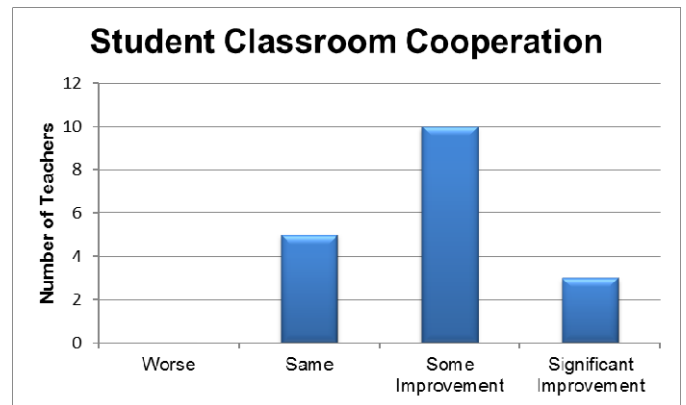


Figure 4. A clear majority of teachers (72%) observed improved student cooperation in the classroom.

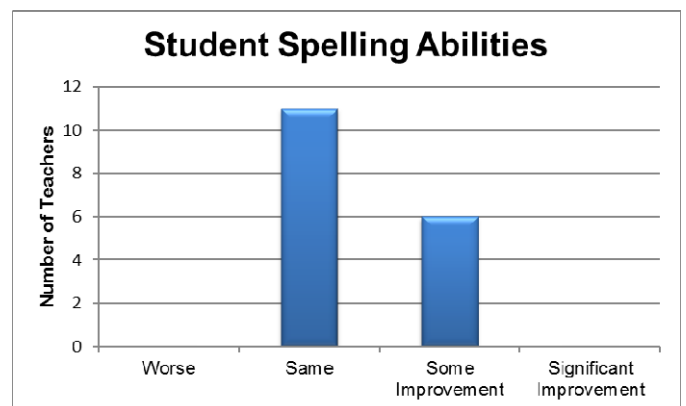


Figure 5. Most teachers did not observe improvements in spelling in their students, though six reported some improvement. A longer duration trial may possibly have resulted in greater effects on spelling abilities. One teacher did not answer the question as the children in her classroom were too young.

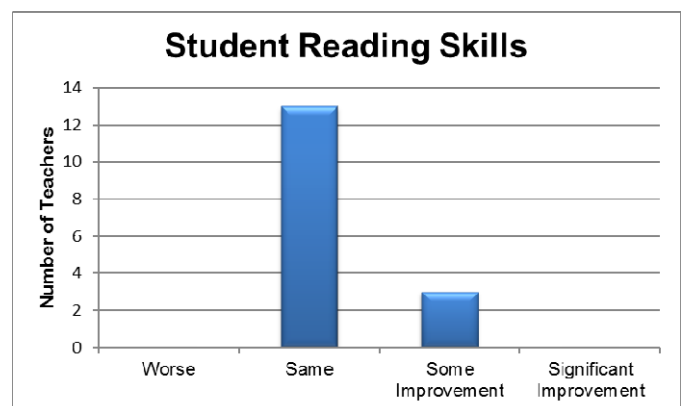


Figure 6. As with the question on spelling skills, most teachers did not observe improvements in student reading, although three did report some improvement. Possibly a longer trial duration would have resulted in more prominent effects on reading skills. Two teachers did not answer this question.

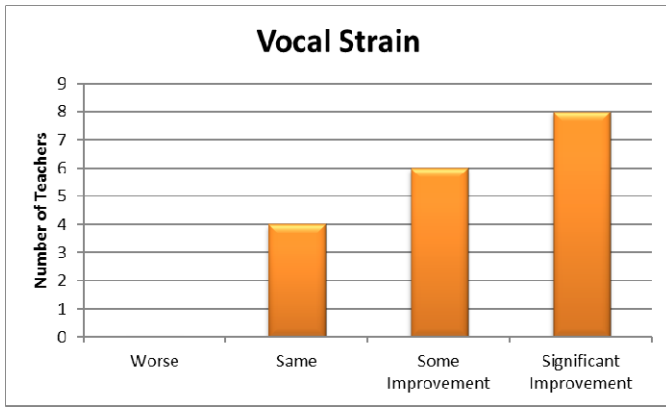


Figure 7. Vocal strain is a problem experienced by the teachers themselves. 14 out of 18 teachers (78%) reported an improvement, and eight (44%) claimed this improvement was significant.

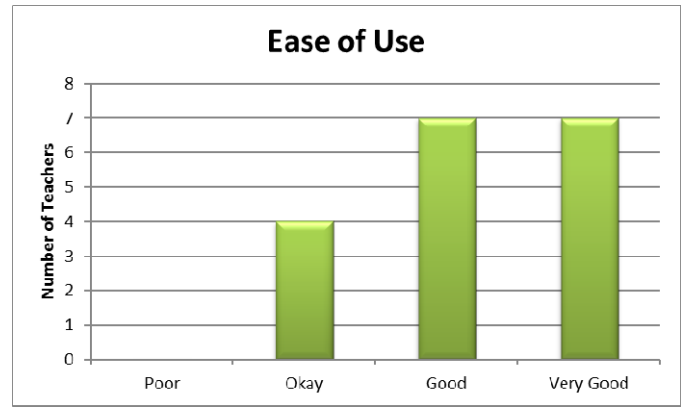


Figure 10. The handling of the Dynamic SoundField system did not pose any of the teachers any serious problems.

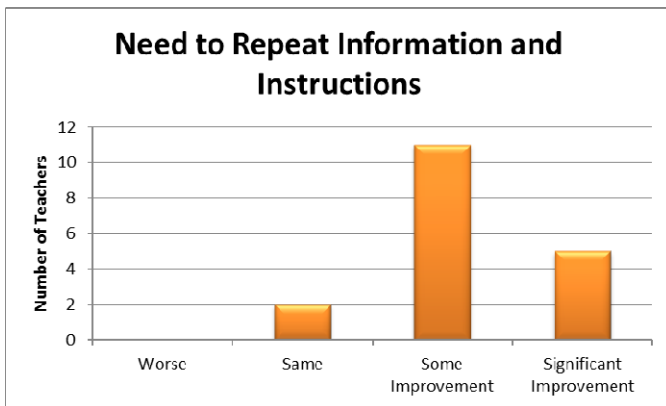


Figure 8. 89% of the teachers felt less need to repeat information and instructions. This effect may have contributed to the reduced vocal strain the teachers reported in question 7.

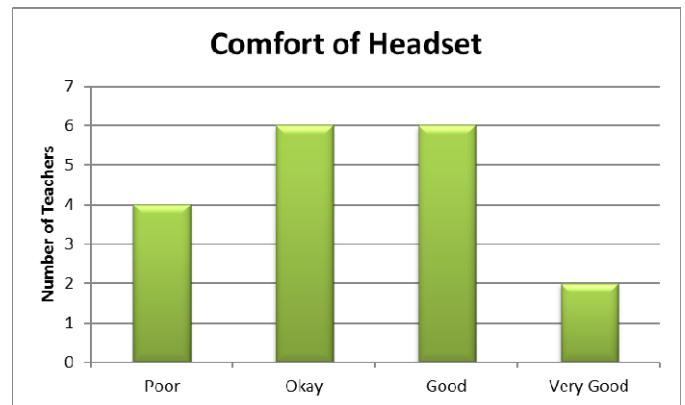


Figure 11. The majority of teachers rated the system's EasyBoom microphone comfort as positive or at least neutral. However four teachers (22%) were not satisfied with its comfort.

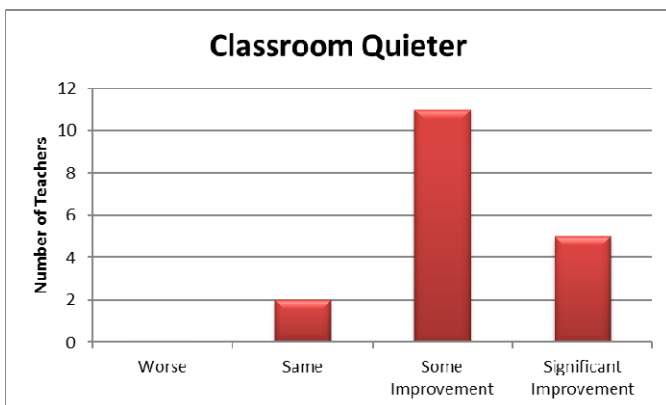


Figure 9. Despite the fact that the voice of the teacher was amplified, a clear majority of teachers (89%) noted that classrooms were quieter overall.

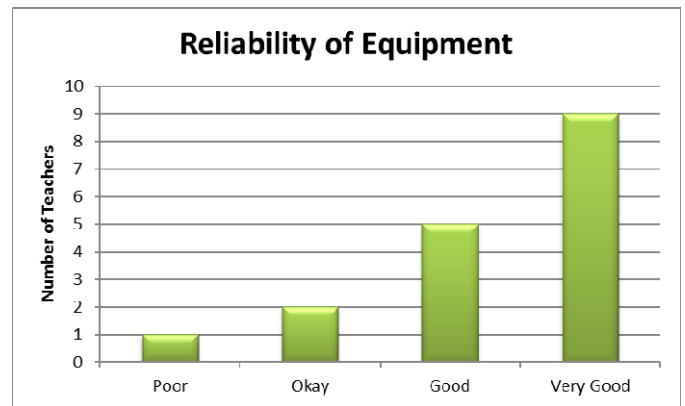


Figure 12. The reliability of the system was generally positively rated. One teacher did not answer this question. The duration of the trial may have been too short to properly judge long-term reliability.



Figure 13. Dynamic SoundField's sound quality was rated positively by most teachers.

## Discussion and conclusion

For all teachers, student performance either improved for all investigated areas or remained unchanged. No teacher indicated that student performance had decreased. These results are in line with those from previous studies (Flexer 2002, and Long 2007). A study comparing the standardized test scores of first, third, fourth, and fifth grade students in unamplified and amplified classrooms in Oregon (Chelius 2004) found that first grade students in the amplified classroom scored an average of 35 percent higher on the Dynamic Indicators of Basic Early Literacy Skills – DIBELS – than students in the unamplified classroom. The same group scored an average of 21 percent higher on the Developmental Reading Assessment – DRA. Fourth and fifth graders in amplified classrooms averaged 35 percent higher in words per minute on a reading fluency test than students in unamplified classrooms.

According to this study's 18 teachers, disruptive behavior decreased and student classroom cooperation increased. Soundfield systems are known to aid class instruction and management and its usage leads to fewer discipline problems through improved voice-control of students.

In this study the subjective judgment of the improvements in spelling and reading skills were relatively modest, possibly due to the short duration of the trial.

Vocal strain was clearly less of a problem with the use of Dynamic SoundField; a known benefit of soundfield systems in general. Voice problems have been found to be a major cause of teacher absenteeism (MARRS Study, 2005).

There was also less need to repeat information and instructions, and this may have contributed to the reduction in vocal strain.

11 teachers felt it was somewhat quieter in the classroom and five even thought it was significantly quieter despite the usage of amplification. A quieter classroom may be the most important acoustical benefit from a soundfield system, as less noise in the classroom directly improves the signal to noise ratio, and better speech understanding leads directly to better learning.

Most teachers considered Dynamic SoundField an easy-to-use system. It is safe to assume that the system's 'switch on and teach' approach contributed to this finding. Unlike many other soundfield systems Dynamic SoundField has no complex on-board settings that need to be adjusted by the teacher or the person installing it. Its frequency response is automatically set and the volume also increases automatically alongside an increase in noise in the classroom.

The majority of teachers rate the comfort of the headset positively or at least neutral. However four teachers were not satisfied with the comfort of the headset. At the time of the study only a EasyBoom headset microphone was available, and Phonak's lapel version was not offered in this study. Generally teachers prefer to use a lapel microphone over a boom microphone, despite the fact that with a boom microphone a soundfield system can provide more amplification, is less prone to feedback and sound quality is usually better. Issues with wearing comfort, interference with hairdos or eyewear, an unstable microphone fixation and lack of proper user instructions on how to wear boom microphones remain obstacles to their wider acceptance.

In general the teachers rated the reliability of the Dynamic SoundField system positively. A more comprehensive reliability test would involve more teachers, schools, different types of classroom environments and certainly a longer duration. Such an extensive study was beyond the scope of the investigations presented here.

The sound quality of Dynamic SoundField received the highest ratings of all the questions. Dynamic SoundField aims to combine the direct voice field of the teacher with the amplified voice of the teacher in such a way that the overall frequency response, in the center of a normal-sized classroom, is transparent with the frequency response of the voice at close range; the object being to achieve a natural sound experience.

It can therefore be summarized that in all investigated domains the teachers' ratings of Dynamic SoundField were favorable.

## References

We would like to thank all teachers and especially Dr. Wendy Bamford, who is the Principal at Wanaka Primary School, for their outstanding support with this study.

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