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## UTILIZATION OF HANDS-ON ACTIVITIES IN THE SCIENCE CLASSROOM: AN ASSESSMENT OF STUDENT PERFORMANCE.

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The objectives of this project were to (1) develop and provide hands-on environmental science activities for use in middle and high school science classrooms and (2) assess changes in student performance following instruction with hands-on activities.

Math and science educators from 21 classrooms across South Dakota participated in the Environmental Classroom project during the 1996 and 1997 school years. Participants were provided a workbook and instruction during two-three day workshops at the Oak Lake Field Station. In addition, participants developed a standardized student assessment tool to evaluate student performance. This assessment tool consisted of 10 multiple choice questions for each activity.

Teachers implemented at least two activities during the school year and evaluated student performance using the standardized assessment tool. Students were evaluated immediately before and after instruction after which data were tabulated and analyzed using a sign rank test.

A total of 953 students from 13 school systems has received instruction during the 1996/97 and 1997/98 school years. Number of students per classroom ranged from 10 to 114 (avg. = 33) and thirteen of 15 activities were utilized by participating educators. Significant improvements in student performance (avg. 13%) were observed following instruction with all but one hands-on activity. Instruction with most activities resulted in improvement equivalent to one letter grade. Changes in performance were greatest following inquiry-based lab exercises (avg. = 20.4 %), followed by mixed field/lab exercises (avg. 12.9%), information survey exercises (avg. 12.8%), field measurement exercises (avg. 12.7%), group discussions (avg. 12.1%), Internet-based exercises (avg. 11. 2%) and library research exercises (avg. 0.7%).

Results of our analysis indicate significant improvement in student understanding of environmental concepts following instruction with Environmental Classroom activities. Furthermore, student performance appears to be enhanced following those activities with inquiry-based field or laboratory components. This information supports existing education efforts sponsored by state agencies within South Dakota and emphasizes the need for inquiry-based instruction within our public school classrooms.