Gravionics Exercises Experiment

An Honors Thesis (HONRS 499)

by

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Purpose of Thesis

This is an experiment involving a new set of exercises called gravionics. There are several warm ups and exercises done in different schools. There seems to be no consensus on which set of warm ups is best, and what is the best focus of those exercises. The reason for this experiment is to determine if students doing the gravionics exercises score better on the posture efficiency test than those who are doing the traditional exercises or nothing at all.

Acknowledgments

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Introduction and Statement of Problem

This is an experiment involving a new set of exercises called gravionics. Gravionics is a series of exercises developed to both strengthen and stretch anterior and posterior muscles. This is to allow maximum movement of the spine. There are several warm ups and exercises done in different schools. There seems to be no consensus on which set of warm ups is best, and what is the best focus of those exercises. The reason for this experiment is to determine if students doing the gravionics exercises score better on the posture efficiency test than those who are doing the traditional exercises or nothing at all.

Hypothesis

The hypothesis tested was that no difference exists in scoring on the posture efficiency test when the students do gravionics versus the traditional exercises of sit ups, push ups, jumping jacks, etc. Gravionics is a term given to these exercises by Beth Kirkpatrick, a physical education teacher in Vinton, Iowa. Gravionics is a set of exercises that use the six different postures as defined by Dr. Robert M. Martin.

Definitions

There are three common and three uncommon postures. The three common postures are erect, horizontal, and flexed. The common postures produce compression and shortening of stature. The erect posture is the posture of dominance; this is when you are sitting or standing. Two-thirds of our lives or 16 hours a day are spent in the dominant postures of sitting and standing (Martin, 1975). Another common posture is the horizontal posture. This is called the posture of neutrality when one is lying on his/her side, back, or front. The final common posture is the flexed

posture. This is called the posture of accessibility and is when an individual is bending forward.

The three uncommon postures are the extended, brachiated, and inverted. These postures produce opposite effects of the common postures such as decompression and elongation. The extended posture is when someone bends backwards lengthening and stretching the abdominal muscles. The brachiated posture is that posture of hanging by the limbs either upper or lower. The final uncommon posture is the inverted posture. This is called the upside down posture when someone is standing on her/his hands or forearms or hanging by his/her lower limbs.

The posture efficiency test was used to determine the level of muscular strength and flexibility of all the students involved in the experiment. This is a test that takes a person through the six basic postures described above to determine how able she/he is to perform in those postures. This test was adapted by Beth Kirkpatrick from Dr. Robert M. Martin's book The Gravity Guiding System. There are six parts to the test, each part dealing with a different posture. For each part of the test, there are three proficiency levels. Each student should be able to score at least to the first level which is worth five points. The second level is worth ten points, and the third level is worth 15. All scores are then added to have a total score on the posture efficiency test.

The first part of the test is for the erect posture testing the ability of the ankles, knees, hips, and spinal column to function in coordination, and the ability of the legs to lift the body. The test involves the person starting in a standing position with the legs spread and toes turned out. The person bends the knees bringing the buttocks as close to the floor as possible and returning to a standing position without assistance. The heels are to stay flat on the floor throughout the entire movement. The first level is being able to squat to a chair seat height. This would be worth five points. The

second level is squatting to mid-calf height. This is worth ten points. The third level is to squat to heel height which is worth 15 points.

The second part of the test deals with the horizontal posture and tests the person's ability to get into and out of the lying posture. The person lies on his/her back with both arms fully extended above her/his head. She/He is to lift both legs simultaneously until there is a 90 degree bend at the hips. This is the highest level of scoring on this part of the test and is worth 15 points. The second level is being able to lift one leg until there is a 90 degree bend at the hips, and the first level is raising both legs simultaneously to the 90 degree bend at the hips with the legs bent at the knees.

The third part of the test assesses the inverted posture. This test assesses the ability to get into and out of the upside down posture. It is also a measurement of the ability to support the body weight through arm and shoulder strength as well as testing balance and equilibrium. The person is to do a handstand. Level one is doing a reverse handstand where the person's stomach faces the wall as he/she walks up it with her/his feet. The individual should end with his/her feet over her/his head. The second level is doing a handstand by kicking the feet up over the head and using a wall to maintain balance. The back is facing the wall. The third level is a free standing handstand.

The fourth part of the test assesses the extended posture; the ability to bend backward and the elasticity and strength of the anterior muscles of the legs and torso. The person starts in a kneeling position on the floor with the hips straight and locked. The legs are spread comfortably with the toes of both feet pointing away from the body. The hands are kept in front of the body next to the abdominal area as the individual bends backward and attempts to touch his/her head to the floor. The individual must be able to return to the starting position without assistance keeping the hips locked at

all times. Level one is being able to bend backward getting the head within ten inches of the floor and returning. The second level is touching the head to the floor but receiving assistance to return to the starting position. Level three is touching the head to the floor and returning to the starting position without assistance.

The fifth part of the test assesses the flexed posture. This tests the ability to bend forward and the elasticity and strength of the posterior muscles of the legs and back. The person is to stand erect and then bend forward as far as possible keeping the knees slightly bent. The first level is to bend forward and grasp the knees. The second level is to grasp the ankles, and the third level is the ability to grasp the toes.

The sixth part of the test assesses the brachiated posture. There are two sub-tests to this part of the test. These tests are to assess the usability of the shoulders and arms and general strength of the torso muscles. The range of motion in the rotational ability of the hips is also assessed. The person is to hang by both arms on an overhead bar; any grip can be used. The first sub-test assesses abdominal, back strength and antagonistic balance. The person is to lift both legs together to waist height keeping them extended for three seconds. This is level three ability. Level two is the ability to lift one leg straight out in front of the body to waist height and hold for three seconds. The first level is to bring the knees up to the chest with the legs bent at the knees.

The second sub-test assesses arm and shoulder strength. Hanging from the overhead bar, the person is to do as many chin ups as possible. The first level is being able to hang with the arms straight for 30 seconds. The second level is being able to do from one to three chin ups, and the third level is the ability to do four or more chin ups.

Significance of the Study

The importance of the posture efficiency test needs to be examined. It has been theorized that the three common postures in which almost all time is spent compresses and shortens stature over the period of a lifetime. Gravity is the main cause of this compression and shortening. Why not use gravity to adjust tissues and structures by creating equilibrium through a combination of postures (Martin, 1975)? Subluxation can result anywhere in the body and indicates a lack of alignment caused by loss of strength between antagonistic muscle groups (Martin, 1975). As a person grows older the pelvis usually tilts forward, and the lower back curves inward (more than ten degrees) to compensate for shoulders that are rounded backward. "Your body becomes sunk in over time" (Martin, 1975, p. 35). This could theoretically be avoided by strengthening and stretching those antagonistic muscle groups by exercising not just in the common postures but also in the uncommon. "Establishing equilibrium between antagonistic muscle groups will permit the spine to achieve its maximum lengthening and maximum shortening for physiological function" (Martin, 1975, p. 49). In a day and age where back problems have become a part of a "normal" life, it is important to find ways to prevent those problems not just rehabilitate them.

Methods

Thirty seventh-graders and 32 sixth-graders were pre-tested in the posture efficiency test. Each part of the test was demonstrated, and they were then tested in groups of five. The evaluators were trained in university classes, and the last evaluator was trained by one of the others. There were two people that tested the seventh-graders. The sixth-graders were tested by four different people in groups of five. Both grades were then divided into a control group and an experimental group. The control group did regular exercises consisting of hamstring stretches, jumping jacks,

toe touches, push ups, and crunches. The sixth-graders did these three days a week, and the seventh-graders did the exercises five days a week. Each grade did the exercises for eight weeks. The control group in the seventh grade did their exercises for two weeks and then were transferred to the health classroom and were no longer doing any formal exercises for the last six weeks of the experiment. The sixth-graders were randomly selected to be a part of the experiment group. Some students in the control group had physical education only twice a week because of a conflict with choir. The seventh-graders selected for the experimental group had physical education five days a week for the first 12 weeks.

The post-test was similar to the pre-test. The same two people did all the post-testing. They post-tested the same seventh-graders that they pre-tested. They tested all of them at once instead of in groups of five. The students lined up and were tested right down the line testing each one of them on each test item. A Pearson Product Moment Correlation was done to test inter rater reliability. The two people testing scored the same ten students. The correlation of scoring was equal to .960.

The gravionics routine used for the sixth- and seventh-graders was the same. The students first did three handstands holding the handstand for five seconds. They could do free standing handstands, kick up against the wall, or walk their feet up the wall into a handstand. Next, the students did sitting hamstring stretches holding behind their knees with their back straight. They did five holding each for five seconds. The next exercise they did was arching backward toward the wall from a kneeling position. They were to keep the hips locked not breaking at the waist. They walked down the wall as far as they could three times holding each for three seconds and then returned to the starting position. The students then did a standing arch. It was similar to the previous exercise but they started from a standing position. They did three of these holding each for three seconds. The students then did standing

hamstring stretches grasping behind the knees and having the knees slightly bent. The last gravionics exercise was the deep knee squats. Each person had a partner who stood in front of them holding his/her hand. The other person squatted as close to the floor as she/he could keeping his/her heels on the floor and back against the wall. The person then returned to the standing position using the partner's hand for balance. The students did one set of ten. Because there were other exercises targeting the brachiated posture that require hanging that they were unable to do because of the inaccessibility of bars, the students did crunches. A couple of the hanging exercises were designed to strengthen the abdominal muscles by pulling knees to the chest, doing alternating leg lifts, and hip rotations. All the exercises with the sixth-graders were done together and counted as a group. The seventh-graders did individual work at their own pace while being supervised.

Three weeks into the experiment, the repetitions of the exercises were increased. The students' handstands were increased from three to five, the sitting hamstring stretches increased from five to seven, the arch exercises from the kneeling position increased from three to five, the standing arch exercises increased from three to five, the standing hamstring stretches increased from five to seven, the deep knee squats increased from one set of ten to two sets, and the crunches increased from 15 to 20.

Results

Five students in the sixth grade experiment group improved their score from the pre- to the post-test. Four students' scores got worse in the experiment group and the six remaining students' scores stayed the same. In the control group in the sixth grade, six students' scores improved, four students' scores got worse, and six students' scores stayed the same.

In the seventh grade experiment group, ten students' scores improved, two got worse and two stayed the same. In the seventh grade control group four students' scores improved, three got worse and seven stayed the same.

Six out of the nine changes in the sixth grade experiment group were in the extended posture with four students getting better and two getting worse. In the sixth grade control group seven out of the ten students showed changes in their scores of the extended posture also. Four students' scores increased and three got worse.

Eight out of the 12 score changes in the seventh grade experiment group were in the extended posture with all of the scores getting better. Five out of the seven changes in the control group were in the area of the extended posture with three getting better and two getting worse. There were also several score changes noticed in the inverted posture part of the test.

There was no significant statistical difference in the students' scores on the test. A t-test was done on the pre- and post-test scores for the sixth-graders with t=1.299 for the pre-test and t=1.576 for the post-test. The critical value for t was 2.048. In the seventh grade pre-test scores, t=1.679, and in the post-test t =.544. The critical value for t was 2.056.

Looking at gain scores, the seventh-graders' scores were approaching a statistical significance much more quickly than the sixth-graders. The t score of gains made in testing was 1.758 for the seventh grade and .228 for the sixth grade. The critical value for t was 2.048 for the seventh grade and 2.056 for the sixth grade.

Findings, Conclusions, and Recommendations

There was no statistically significant difference between the scoring on the posture efficiency test of those doing gravionics and those doing regular exercises. There could be several reasons for these results including familiarity with the test, the

measure of changes in the test itself, the student's effort, and the length of time for the study.

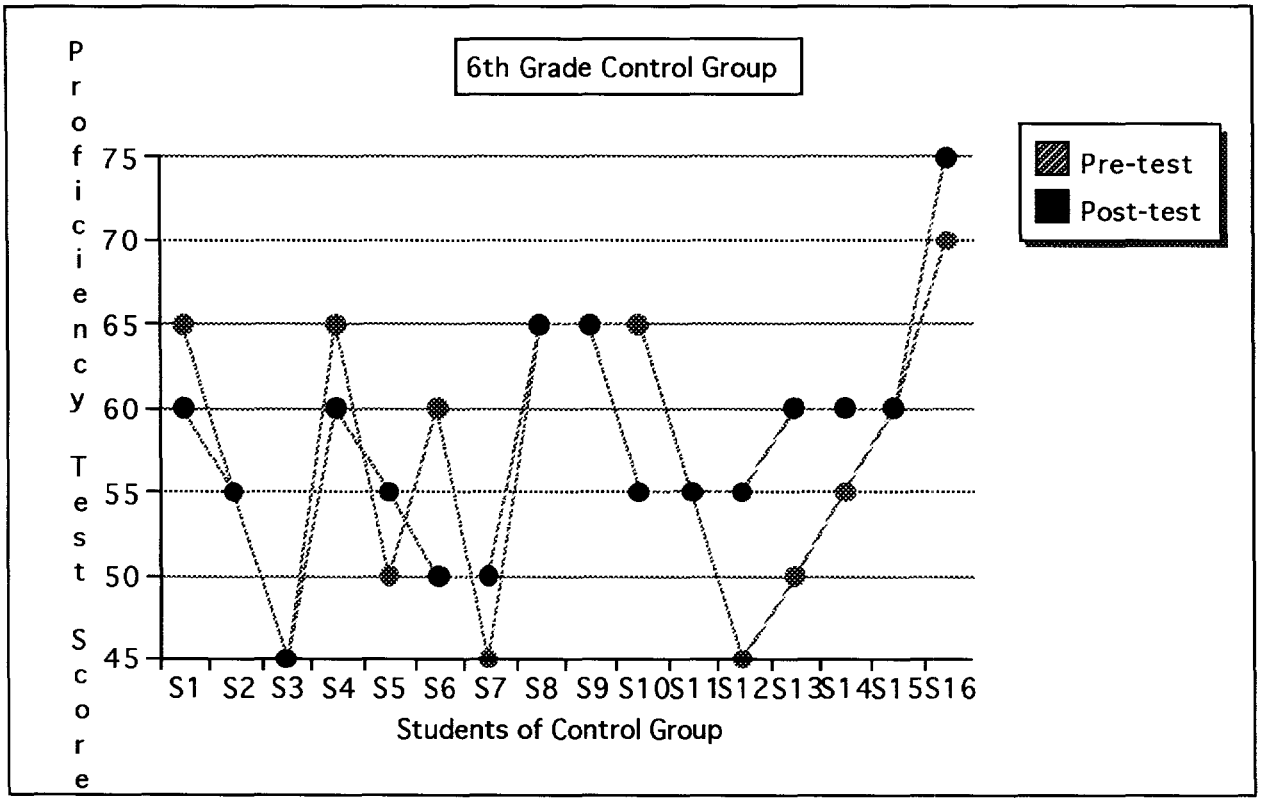
According to the t scores as mentioned in the results section, the seventh grade students were improving at a faster rate than the sixth grade students. This may indicate a difference in the three day a week program versus the five day a week program. It appears that if the experiment lasted longer there may have been a statistical difference. This can also be shown in the gain scores between the pre- and post-tests. The seventh-graders were approaching the statistical difference much more quickly than the sixth-graders. The mean scores of gain between the two tests also point to this conclusion. The seventh-graders had a mean gain of 5 in the experiment group with the sixth-graders having only a mean gain of 1.071 for the experiment group. These facts seem to point to the possibility of a great difference in the three day a week versus five day a week program. As stated before, both grades of students were approaching a statistical difference, therefore, extending the experiment to ten or 12 weeks could have also yielded a significant statistical difference.

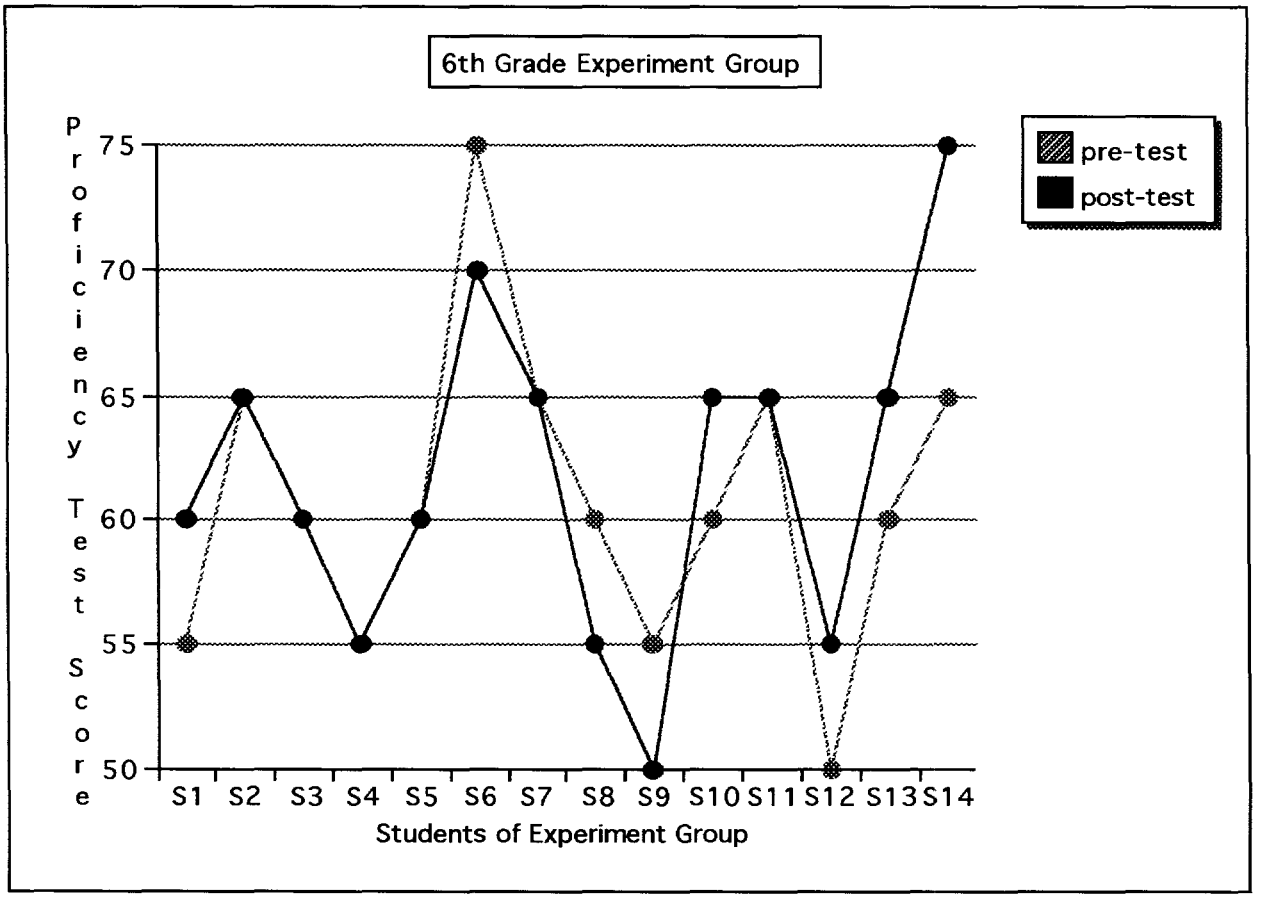
One possible reason for a change in scores could be the students' familiarity with the test. This could explain the improvement of scores for those in the control group. Most changes were also seen in the uncommon postures tests. The students most likely had no previous exposure to those exercises, and a change could take place merely by experiencing the test again.

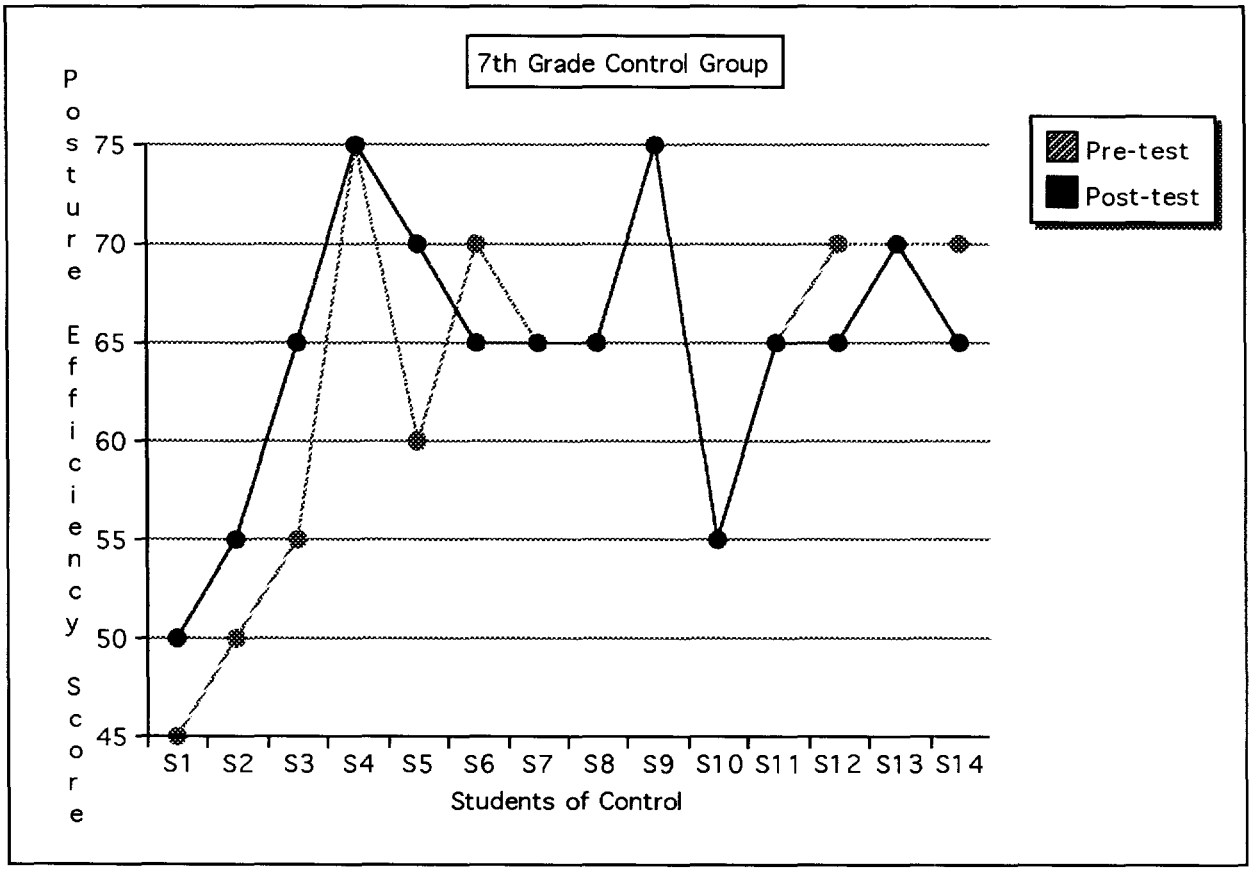
It was surprising to see some decline in scoring for those in the experimental groups. This could be due to student effort . Some students may have tried harder during the pre-test than on the post-test. This could also be explained by a possible lack of good technique in performing the exercises during their daily routines. These were things that could not be statistically determined.

Another thing possibly affecting the scoring was the range or great change in ability needed to pass on to the next proficiency level. For example, in the inverted posture, an individual must be able to get his/her head within ten inches of the floor and return to the starting position again in order to score on the first or lowest level. There were several students that could not even go down that far. However, by the end of the experiment, they could bend backward at least four or five more inches than in the pre-test. They had definitely shown improvement, but because of the scoring for the test, their score did not exhibit that improvement. This was the most affected test by the degree in scoring.

It is recommended that a future study be done over a longer period of time, at least ten to twelve weeks long, and that there be a comparison between a three and five day a week program. Also, it would be more accurate to add some additional proficiency levels to some of the more difficult test items to make known the smaller but significant changes in proficiency.


6th Grade Control Group
Proficiency Test Score
75
70
65
60
55
50
45
S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16
Students of Control Group
Pre-test
Post-test


6th Grade Experiment Group
Proficiency Test Score
75
70
65
60
55
50
S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14
Students of Experiment Group
pre-test
post-test


7th Grade Control Group
Posture Efficiency Score
75
70
65
60
55
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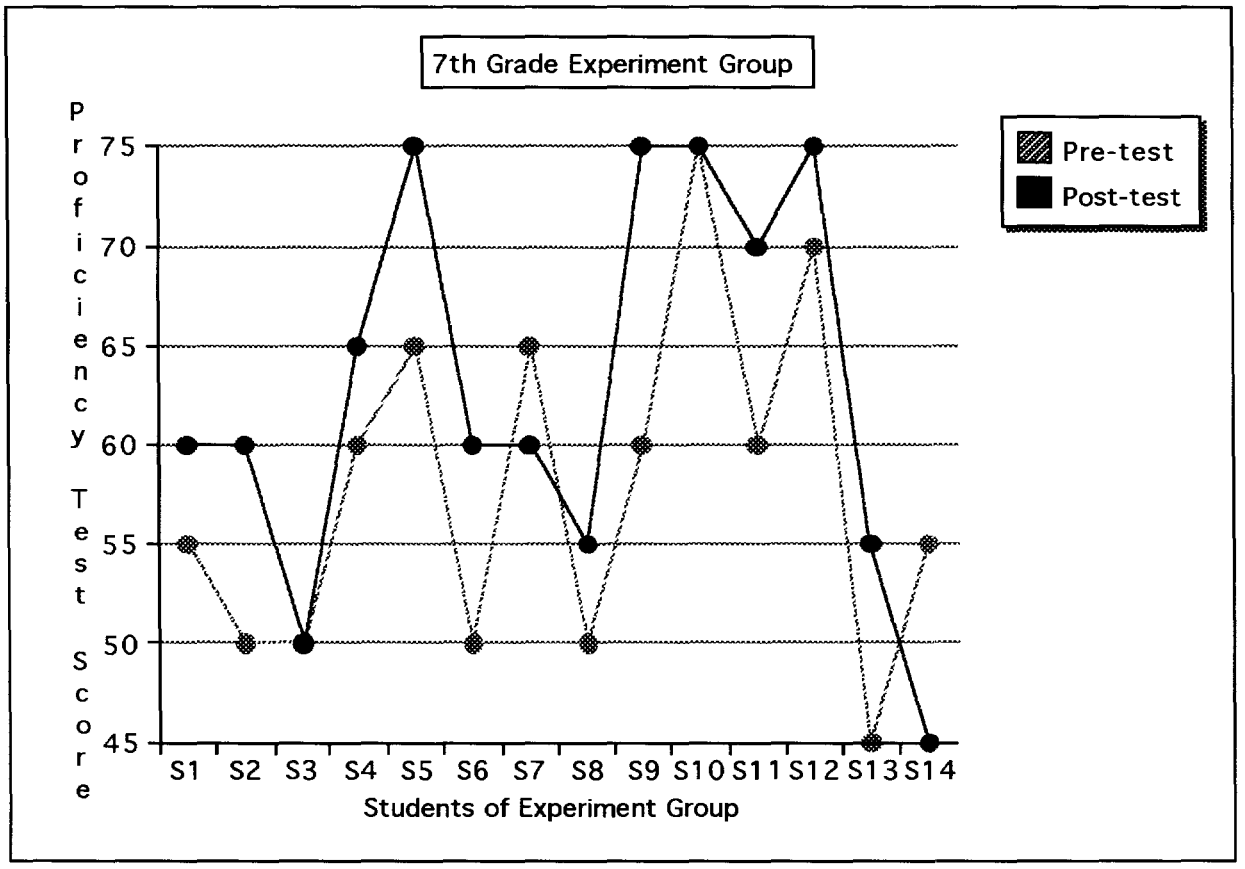
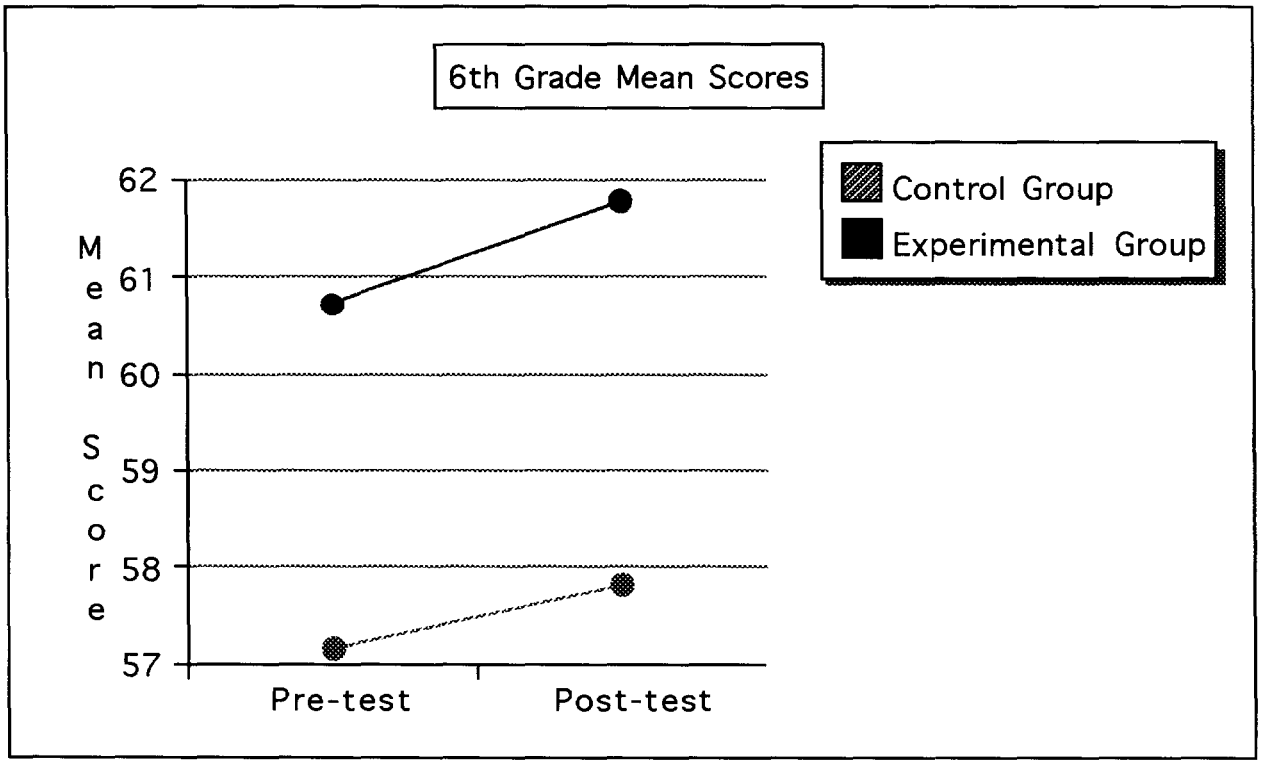
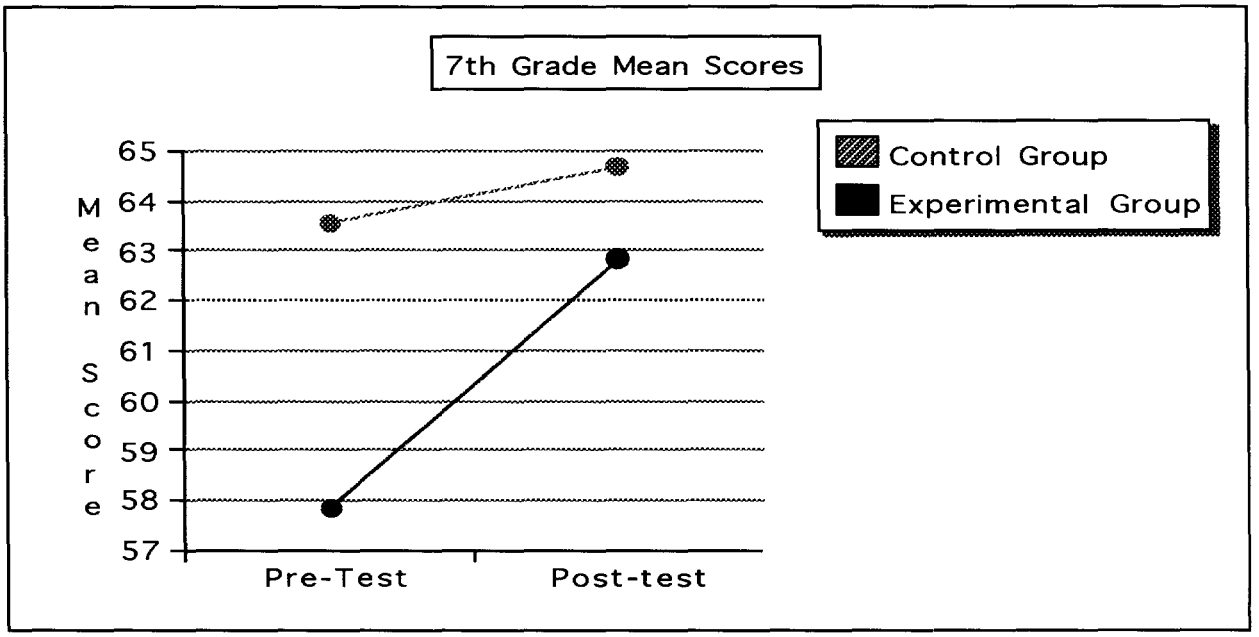
45
S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14
Students of Control
Pre-test
Post-test


7th Grade Experiment Group
Proficiency Test Score
75
70
65
60
55
50
45
S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14
Students of Experiment Group
Pre-test
Post-test


6th Grade Mean Scores
Control Group
Experimental Group
Mean Score
62
61
60
59
58
57
Pre-test
Post-test


7th Grade Mean Scores
Control Group
Experimental Group
Mean Score
65
64
63
62
61
60
59
58
57
Pre-Test
Post-test

Bibliography

Kirkpatrick, B. (1993). The ultra shuffle: Who's keeping score? Grundy Center, IA: For Your Heart.

Martin, R. (1975). The gravity guiding system. Los Angeles: Author.