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ABSTRACT

This study is concerned with analyzing the effects of classroom environment on students' achievement and perceptions of their learning environment. The learning environment was analyzed from the perspectives of teachers, students, and principals. The sample included one class from each of 25 elementary schools, including architecturally open schools as well as schools of conventional architectural design. Student subjects were enrolled in second, third and fourth grades. The Open Education Teacher Questionnaire (OETQ) was used to establish criteria for openness. The total openness scores of teachers and principals on the OETQ were used to separate sample schools into three groups: traditional, medium open, and high open. Scholastic achievement and student perception of the learning environment were measured by the Metropolitan Achievement Test (MAT) and My Class Inventory (MCI), respectively. Teacher and principal scores on the OETQ, as well as pupil data, were analyzed by using both univariate and multivariate statistical techniques. Data from white pupils and black pupils were analyzed separately. A number of findings are discussed and data tables are included. (Author/MS)

The Open School: Cognitive and Phenomenological Correlates

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This study is concerned with analyzing the effects of classroom environment on students' achievement and perceptions of their learning environment. The learning environment was analyzed from three perspectives: (1) The classroom environment as perceived by teachers; (2) The learning environment as perceived by students; and (3) The learning environment as perceived by principals.

Using the total openness score of teachers and principals for a basis of trichotomization, the Open Education Teacher Questionnaire (OETQ) established criteria for openness and permitted the formation of three groups, ranging from conventional to high open. Scholastic achievement and student perception of the learning environment were measured by the Metropolitan Achievement Test (MAT) and My Class Inventory (MCI), respectively. Teacher and principal scores on the OETQ, and pupil data were analyzed by using both univariate and multivariate statistical techniques.

Background of the Problem

Featherstone (1967), in a series of articles in The New Republic, introduced the concept of open education to educators and parents. Since that publication, interest in the approach suggests that it has become a serious alternative to the conventional self-contained classroom.

Open education, to many school districts in this country, is synonymous with the organization of teams of teachers within a building of open architectural design. The concept of open education (Bussis and Chittenden, 1972) can be defined by the way teachers interact with students along the following dimensions:

1. Guidance and extension of learning.
2. Provisioning the classroom for learning.
3. Diagnosis of learning events.
4. Reflective evaluation of diagnostic information.
5. Respect, openness, and warmth.
6. Seeking opportunities to grow personally and professionally.
7. Positive view of themselves and their roles.
8. Progressive view of children and the learning process.

Open education is difficult to characterize. Walberg and Thomas (1972) content that it has grown "...out of many old truths, perhaps cliches about children and the learning process." In an attempt to account for its complexity and lack of standardization, they suggest that the approach has grown out of practical experience rather than philosophical, theoretical, or scientific foundations.

To further complicate the problem of understanding the concept, the following labels are often used interchangeably; (1) open classroom, (2) open-space schools, (3) open education, (4) informal education, (5) integrated day, (6) British primary school, and (7) Leicestershire method. For our purposes the terms open classroom and open education will be used synonymously in this study. The term "open-space school," when used, will refer only to the physical aspect of the building.

It is not uncommon for a school district to use one of the above labels to describe a wide variety of "open" education programs in its system. This inconsistency or program diversity is justified by educators as being necessary in providing for the needs of individual

communities. Upon first-hand observation of ongoing "open" education programs the individualized approach does not always appear to be practiced at the classroom or student level. Featherstone (1971) indicates that in many open programs, "...there is no basic change in methods of teaching or classroom organization." He parallels this movement with progressive education in America's schools during the 1920's and 1930's. This conclusion was reached from his observation of schools both in Britain and the United States.

The evolving nature of open education creates a considerable amount of misunderstanding of the concept. To conceptualize the approach and its progression from conventional methods to an open method, it is necessary to place Nyquist's (1972) description of conventional and open classrooms on a continuum. Figure I compares educational experiences of students in conventional classrooms with experiences of students in open classrooms.

Figure I -- Conventional Classroom and Open Classroom Continuum

Conventional Classroom	Open Classroom
1. information-gathering	1. problem solving
2. fact-centered	2. idea-centered
3. course-centered	3. experience oriented
4. subject-centered	4. interdisciplinary
5. norm-referenced evaluation	5. individualized instruction and evaluation
6. teacher dominated	6. teacher-student planning
7. vicarious and confined to classroom	7. interaction with things and extends to community

At the conventional end of the continuum, tendencies of the teacher, the curriculum, and the learning process constitute the philosophic foundations of essentialism. Positions of these educationists appear to be consistent with a line of mainstream educators from Plato to programmed instruction advocates. These educators typically classify the curriculum into subjects, group learners by ability, and view knowledge as represented authoritatively by the teacher or in prescribed vicarious materials of instruction (Plowden Report 1967). The psychological foundations of conventional classrooms are most nearly in accord with the names of Throndike, Hull, Pavlov, Skinner, and other behaviorists.

Conceptually, the open approach to teaching is in stark contrast to the conventional. The underlying philosophic principles of the open approach are most nearly associated with the progressive work of Dewey and the rights of children for which Rousseau argued. Advocates of the open education approach claim that the environment is much freer, more informal, highly individualized and provides the student a voice in planning the educational program. Walberg and Thomas (1972) believe that educators at this end of the continuum have points of view which are "...consonant with developmental, humanistic, and clinical psychology."

Significance of the Study

An examination of fifty projects, papers, and abstracts recorded with ERIC (1973) indicated that much attention has been directed toward the physical aspects of open education e.g., open architectural design, furniture, movable partitions, and flexible arrangement of space. Little attention was paid to student perception of the learning environment and achievement. The most recent study of open education (Wright, 1975) took

into account both building design and teachers' orientation in an effort to compare students' achievement, cognitive ability, creativity and three measures of personality. Over a two and a half year period, the students were found to differ on several achievement variables (in favor of the conventional classrooms), but no difference was found on any of the cognitive or personality variables. Wright's use of teacher orientations in addition to their placement in buildings of different architectural design was laudable but the relatively small sample size (two buildings, less than five teachers, and 100 students), leaves something to be desired when generalizing to larger populations.

As part of an open-space research program at Stanford University (1970) a national survey was conducted to determine open education trends in this country. A significant finding of the study showed that over 50 percent of 2,500 new schools constructed from 1967 to 1969 were of open type design.

Dopyera (1972) argues that since the Unived States is spending billions of dollars for programs to benefit children, we certainly need evidence that the programs make a difference. Although the increase in number of open space buildings is an indicator of growing interest, it is unlikely that the building itself will have any direct measurable effect on student achievement or the learning environment. Indeed, a preliminary study indicated that only 65 percent of the teachers in architecturally open schools are operationally open in their behavior (Morris, et al, 1975).

Walberg and Thomas (1972) point out that "...there has been very little research and evaluation on open education, aside from testimonials by exponents and reporters." Their point is substantiated by an annotated

bibliography on open education by the Toronto School Board (Ontario, (1972). The school board compiled a list of eighty-six annotations on open education.

Examination of the list of annotations showed that, with the exception of the Plowden Report, only three studies dealt with achievement in an evaluative manner. One study which used the Iowa Test of Basic Skills, concluded that there was no significant difference in the achievement of three open and three conventional third-grade classrooms. The other two studies were performed in England. Test results were not made available (Toronto School Board, 1972).

Research and evaluation of social climate is even less conclusive. The Toronto School Board's annotated bibliography included only one study, (Appleberry and Hoy, 1969) which focused on the ideological orientation of school personnel and the type of organizational climate that resulted from their ideologies. By using the Pupil Control Ideology Form (PCI) and the Organizational Climate Description Questionnaire (OCDQ), investigators of the study found that schools with open climates were significantly more humanistic than schools with relatively closed climates.

While a review of related literature identified several studies comparing student achievement or organizational climate measured at the teacher level, none of the studies compared achievement and the student's perception of social climate. It would appear that before either or both of the variables (achievement and climate) can be compared between open and conventional classrooms, open education must be operationally defined.

Instrumentation

The OETQ was developed by Walberg and Thomas (1972). The original instrument consisted of eight "themes" or categories containing 50 items. Walberg and Thomas used "content analysis" to establish these categories. Our conceptualization of openness was based on an item analysis of the OETQ. The original instrument was not replicated in our sample of 18 principals and 29 teachers. Instead, a factor analysis generated four subscales containing a total of 44 items. A Chronbach Alpha of the sum of all subscales was in excess of .86. For principals the total openness score yielded an Alpha coefficient of .90 and for teachers the coefficient is .86.

The revised OETQ contains the following subscales:

1. Diagnosing, organizing and evaluating the learning environment -- This scale is characterized by the way teachers and principals perceive the diagnostic-evaluative processes, and organization of the environment for instruction (13 items).

2. Teacher controlled and dominated environment -- This scale describes teacher and principal tendencies which are associated with traditional education, e.g., instructional activities are organized only by the teacher, classes are organized by grades and lessons are assigned to the class as a whole, etc. (13 items).

3. Seeking and expectations -- Scale three is defined by the way teachers and principals seek professional growth and their expectation of pupils in terms of academic achievement (7 items).

4. Provisioning the physical environment -- This scale measures the extent to which diversified equipment and materials are provided for the learning environment (11 items).

The My Class Inventory (MCI) contains 45 items distributed over scales of Satisfaction, Friction, Competitiveness, Difficulty and Cohesiveness.

Anderson (1971) conceptualizes the five scales, thus:

> The Satisfaction scale is concerned with whether students are...well satisfied with the work of the class. Friction is thought of as lack of cooperation by certain members of the class. Competitiveness is concerned with students competing to see who can do the best work. Difficulty pertains to whether students are constantly challenged. The Cohesiveness scale examines whether members of a class are personal friends.

While individual scale reliabilities range from .54 to .77, Anderson (1973) maintains that the instrument has been used successfully in several research and evaluation studies. Unlike the OETQ, the subscales of the MCI remain intact.

Statistical Analyses

In the first procedure, the protocols of white and black children on available MCI and achievement data, were separated. The rationale behind this procedure is quite straight forward, i.e., although there is no prior basis for believing that the group of black and white children would differ on the phenomenological i.e., the MCI variables, they might on the achievement variables. Because of the multiplicity of societal presures, black children do not achieve in school as well as do whites. This separation is an example of what Winer (1962) calls "direct control" (Page 578).

Trichotomization of the Protocols

Utilizing the total openness score of the principals as the basis for trichotomization, there were 312 protocols from the white children but we did not discard the data on the 95 additional white students who attended schools in which the principals had not completed the OETQ.

Thus, for these 95 white children we utilized instead the total openness score of their teachers as the basis for assignment into groups. Trichotomization was based on "gaps" in the distribution; e.g., the traditional schools category had a range of scores (from either the principals or teachers) from 102 to 117, the "medium open" schools range was from 118 to 133 and finally the "high open" schools were based on scores (from either the principals or the teachers) from 139 and above. For white children there were 147 pupils in the conventional category; in the medium category 126; and in the high open 137.

Once these three groups were established, we utilized as dependent variables the five affective (MCI) variables and two cognitive or achievement scores; the total Reading and the total Math scores of the Metropolitan Achievement Test. To compare the three groups, single classification analysis of variance (missing data) was used. The particular computer program employed was one from the University of Alberta at Edmonton, Canada which provides means, standard deviations, sums of squares, etc. The program handles missing data, prints out tests for homogeneity of variance and also provides a Scheffe probability matrix. The Scheffe is a highly rigorous test and Scheffe himself suggests utilization of an alpha level of .10. We followed this recommendation except in those instances where homogeneity of variance did not prevail. A similar procedure was utilized with the data on the black children but the N's for these latter groups were much smaller (144 total with 37 on the conventional group, 60 in the "medium open" and 47 in the "high open").

Method

Sample

The population from which the sample was drawn consisted of fifty-seven kindergarten through fourth grade schools and two kindergarten through fifth grade schools of a southwestern metropolitan school system. Ten open-space and modified-space schools were randomly selected from the district's twenty architecturally open schools. Fifteen of the thirty-nine schools of conventional architectural design were randomly drawn.

One teacher and her class were randomly drawn from each school's teacher-roster. Teachers with less than one year teaching experience in the school design in question were excluded from the study. The sample included second, third, and fourth grade students. Classes for gifted children, and the educationally mentally retarded children were not included in the study.

Following notification to principals that their schools would be involved, a visit was made to each school. Over a six-week period during the months of March and April, 1974, separate conferences were held with principals and teachers at which time the OETQ was administered. Each was asked to respond to the OETQ in terms of what was happening in the classroom, rather than what they thought should be happening. Based on OETQ results, a tricotimization was formulated for principals and teachers categories: traditional, medium open, and high open.

While the principal and teacher completed their instruments in separate settings, the investigators administered the MCI to students. Instructions for responding to the MCI items were read to students, as was each item of the instrument. This process was used in an effort to

overcome lack of understanding of item concepts due to poor reading skills which some students may have been experiencing. Principal, teacher, and student instruments were collected before leaving the school.

Findings

Tables 1-5 show the results of the comparisons of three groups of white and black children on the five MCI variables and the two achievement test score means. These tables also indicate whether or not homogeneity of variance prevailed and the Scheffe probability matrix is also reproduced. For these seven dependent variables, an analysis of covariance was also accomplished (grade and age were the covariates and where applicable the adjusted F ratio is asterisked).

Tables 1-5 about here

Satisfaction

Note should be made of the changing N's, e.g., there were only 399 respondents who completed the Satisfaction scale of the MCI. For this variable, a homogeneity of variance did not prevail, however, the F ratio was significant ($F=10.08$, 2, 396, $P<.005$). Following McNemar (1962, p. 252) we adjusted our alpha level from .01 to .005 on those instances where the assumption of homogeneity of variance was violated.

For white students, the probability matrix for Scheffe's multiple comparison of means indicates that the differences are between the medium open school and both the conventional and the high open school.

The F ratio of 10.08 is adjusted to 7.90 when grade and age are covariates and is the criterion variable. The adjusted F is significant (2,396, $P < .001$).

Homogeneity of variance did not prevail for the three groups of black students. The probability matrix for multiple comparison of means indicates that the difference is between the high open and the conventional groups. The F ratio was significant ($F=2.81$, 2,139, $P < .06$).

Friction

The medium open school setting shows less friction for white students as evidenced by a mean score of 5.06 ($F=9.86$, 2,396, $P < .0001$). The Scheffe matrix indicates that the difference in the three means for white students are again between the medium open and both the conventional and high open groups. The adjusted mean squares reduce the F ratio to 6.52 ($p < .002$). There was no significant difference in mean scores for black students on the friction variable.

Competitiveness and Cohesiveness

On the MCI variables of competitiveness and cohesiveness there are no statistically significant mean differences and no discussion seems warranted. Analyses of covariance yielded similar findings.

Difficulty

Although the variances are heterogeneous, the F ratio for difficulty is 14.00 (2,396, $P < .001$). The most difficult school environment for white students is the medium open school followed next by the high open with the lowest expression of difficulty emanating from children of the conventional school. The Scheffe matrix indicates that both the medium

and high open school means differ from the conventional school mean. The adjusted F ratio is 10.79 ($p < .01$). There were no significant mean differences for black students on the difficulty variable.

Reading

White students in the "high open" school achieved a mean score of 63.34, while students in the conventional school achieved a mean score of 62.35 and students in the medium open school achieved a mean of 57.76. Homogeneity of variance prevailed. The F ratio of 3.65 was significant ($P < .05$). The differences are between the high open and the medium open schools. With grade and age covaried, the adjusted F ratio is raised to 4.02 ($P < .01$). Table VI shows no significant differences of mean scores for black students.

Mathematics

On the Total Math variable, children (white) in the "high open" schools achieved a mean of 72.10, children in the conventional schools achieved a mean of 67.81 and children in the medium open schools achieved a mean score of 66.51. Homogeneity of variance prevailed and the F ratio of 3.29 was significant ($P < .05$). The Scheffe matrix indicates that the differences are again between the "high open" and the "medium open" while the difference between the "high open" and the conventional schools is not significant. Adjusted analysis of variance raised the F ratio to 3.55 ($P < .05$).

Black students in the "medium open" schools showed higher achievement in math as evidenced by a mean score of 53.46. When comparing mean scores between the "high open" and conventional schools, achievement favors children in high open schools (49.57 and 43.11, respectively). Homogeneity

of variance again prevailed and the F ratio of 3.83 was significant ($P < .05$). Adjusted analysis of variance raised the F ratio to 4.79 ($P < .05$).

Discussion

MCI Variables

This study was concerned with analyzing the learning environment from two perspectives. Another analysis was performed on scholastic achievement scores. First, principal and teacher perceptions of the learning environment were measured by the OETQ. Based on OETQ, criteria, conventional, medium open and high open groups were established for principals and teachers. Thus, analyses revolved around the comparisons between and among the trichotomized categories of these groups.

Satisfaction of students (whites) was found to favor students in the medium open schools. (Black students expressed more satisfaction in high open schools). One can only speculate as to the reason for this phenomenon. However, it seems safe to argue that while students are more satisfied with the move from a conventional school setting extreme reorganization of the environment tends to be less satisfying and may lead to confusion and disorganization. As we compare satisfaction between students of conventional schools and high open schools, the mean scores indicate a higher level of satisfaction for the high open group.

Students (black and white) in the medium open schools reported less friction than either the conventional or high open groups. Children in high open schools experienced less friction than did children in conventional schools. This is a surprising, yet encouraging, finding in that open schools represent a more open and diversified climate. As differences are compared between the conventional and high open schools, we may draw the same conclusions for the friction variable as for the satisfaction variable.

There was no satistically significant mean difference among the three groups of students (black and white) on the MCI variables of competitiveness and cohesiveness. While open educators value cooperation of students as a desirable characteristic, they view competitiveness as an obstacle in establishing and maintaining an intimate climate. Conversely, cohesiveness is viewed positively in establishing an open school environment.

An extremely interesting finding emerged on the difficulty variable. One of the charges leveled against open schools is that they are loosely organized and sacrifice "academic rigor." It is of interest to note that while white children in medium open schools perceived their class work as being more difficult than the other two groups, children in high open schools felt that their work was more challenging than did children in conventional schools. Black children, as can be noted from examination of Table V, found their class work to be more challenging than did black children in conventional schools.

MAT Variables

When the three groups are compared on the variables of "total reading", white students in the high open group achieved a mean score in excess of both the conventional and medium open groups (see Table VI). While this difference is not statistically significant, it should be encouraging to open education advocates. Black students in the medium open schools achieved a slightly higher mean score than students in the high open, with black students in conventional schools achieving a smaller mean score on the "total reading" variable. Again, differences were not statistically significant. Silberman's (1970) contention appears to be applicable to the findings for the total reading variable. He argues that while open class-

rooms are at least as effective academically as traditional classrooms, they may well benefit their students in other ways (p. 66).

A statistically significant mean difference along the "math" variable was found to favor white students in the high open schools. The total math mean score for white students in conventional schools was relatively lower than for students operating in the other two groups. Paradoxically, when comparing total math achievement of black students, medium open schools report a higher mean score. While not significant, black students in high open schools achieved a higher mean score than did students in conventional schools.

These findings vis-a-vis the achievement variables indicate that for our sample the conclusion is warranted that white children in high open schools experienced superior achievement (not statistically significant) than children in conventional and medium open schools. This finding is of particular interest in view of Wright's (1975) report that children in a traditional school in Philadelphia scored higher on achievement variables than did children in an open school.

Conclusion

For white students, we may conclude that our data indicate that virtually without exception, the mean scores on achievement variables of "high open" school children are significantly higher than the "medium open" schools and in instances, higher than the means of the conventional school children. Perhaps confounding variables were present but not age nor grade since these were used as covariates.

The N's on the black children were considerably lower than were the N's for the white children. In the "conventional" group there were 37 black children, in the "medium open" group, there were 60. In the "high open" there were 47. Again the trichotomization was accomplished by

utilization of either the principals' total openness score or where principal scores were not available, the teachers' openness score. Note that on the MCI variables there are no statistically significant differences among the three group means except possibly for the Satisfaction variable. However, this finding is at best dubious. Heterogeneity of variance was present and the F ratio of 2.81 could have happened by chance 6 times out of 100. The Scheffe matrix does indicate that the means of the "high" open school children differed significantly from the means of the "conventional" school children with the "high" open black children being more satisfied. In general, however, it seems safe to conclude that unlike the comparisons for the white children "openness" or "conventionalism" of school milieu appeared not to influence MCI variables. On the Reading Score there were no significant differences in the three means. However, on Math please note of the high open schools black children achieved a mean score of 49.57 whereas black children of the high open schools achieved a mean score of 43.11 while the medium open achieved a mean score of 53.46. With homogeneity of variance, an F ratio of 3.83 could occur by chance alone .02 times out of 100. The Scheffe matrix indicates the difference is between the "medium" open black children and the "conventional" black children with the difference in favor of the "medium" open. The achievement score of black children (unlike the white children, and with the exception of math achievement) appear not to be influenced by the dimension of openness. Adjusted analyses of variance yielded an F ratio of 4.79 ($P < .05$).

Implications

That there may be limitations in this study is acknowledged e.g., we did not have SES data. But despite this possible defect, we can assert

with confidence, based on our data, that open schools do not appear to have adverse influences on achievement variables. Of the 7 significant findings, 3 favored children in "high open" schools over either the conventional or medium open groups; 3 significant findings favored children in medium open schools; and 1 significant finding favored children in conventional schools.

Our report indicates that children in schools where principals and teachers manifest an open approach to education encountered more satisfying and cohesive experiences than did children in conventional schools. Children in medium and high open schools were superior to children in conventional classrooms in overall academic performance.

Admittedly, our findings cannot be taken as final evidence to Dopyera's (1972) request for proof that programs for which the United States is spending billions of dollars make a difference. Benefits of open education call for much larger accumulations of data in a variety of settings. Indeed the jury is still out and our work should be viewed as a step toward judgement, and not a final judgement in and of itself.

TABLE I

VARIABLE: SATISFACTION

White Students Only				Black Students Only			
Group	N	Mean	S.D.	Group	N	Mean	S.D.
1. Conventional	140	5.24	2.44	1. Conventional	37	5.14	2.36
2. Medium Open	126	6.37	1.73	2. Medium Open	59	5.75	2.19
3. High Open	133	5.55	2.05	3. High Open	46	6.22	1.59

P < .00005

F-ratio = 10.08*

Homogeneity of Variance Test Chi-square = 15.53
Prob. = .0004

Probability Matrix for Scheffe Multiple Comparison of Means:

	1	2	3
1.	1.0000	0.0001	0.4873
2.	0.0001	1.0000	0.0075
3.	0.4873	0.0075	1.0000

*Homogeneity of Variance did not prevail (adjusted F = 7.90).

P < 0.063412

F-ratio = 2.81*

Homogeneity of Variance Test Chi-square = 6.9643
Prob. = 0.0307

Probability Matrix for Scheffe Multiple Comparison of Means:

	1	2	3
1.	1.0000	0.3730	0.0634
2.	0.3730	1.0000	0.5116
3.	0.0634	0.5116	1.0000

*Homogeneity of Variance did not prev[illegible]

TABLE II

VARIABLE: FRICTION

White Students Only				Black Students Only			
Group	N	Mean	S.D.	Group	N	Mean	S.D.
1. Conventional	138	6.07	2.09	1. Conventional	36	5.72	1.88
2. Medium Open	125	5.06	2.13	2. Medium Open	60	5.47	2.17
3. High Open	133	6.02	2.11	3. High Open	47	5.70	2.02

$P < 0.000073$

F-ratio = 9.86*

Homogeneity of Variance Test Chi-square = 0.6591
Prob. = 0.7192

Probability Matrix for Scheffe Multiple Comparison of Means:

	1	2	3
1.	1.0000	0.0004	0.9805
2.	0.0004	1.0000	0.0010
3.	0.9805	0.0010	1.0000

*Homogeneity of Variance did prevail (adjusted F = 6.51 P. = .002).

$P < 0.781462$

F-ratio = 0.25*

Homogeneity of Variance Test Chi-square = 0.9518
Prob. = 0.6213

Probability Matrix for Scheffe Multiple Comparison of Means:

	1	2	3
1.	1.0000	0.8402	0.9990
2.	0.8402	1.0000	0.8410
3.	0.9990	0.8410	1.0000

*Homogeneity of Variance did prevail.

TABLE III

VARIABLE: COMPETITION

White Students Only			
Group	N	Mean	S.D.
1. Conventional	143	5.92	1.70
2. Medium Open	126	5.93	1.96
3. High Open	137	6.28	1.63

P < 0.165939

F-ratio = 1.80*

Homogeneity of Variance Test Chi-square = 4.8552
Prob. = 0.0882

Probability Matrix for Scheffe Multiple Comparison of Means:

	1	2	3
1.	1.0000	0.9997	0.2450
2.	0.9997	1.0000	0.2783
3.	0.2450	0.2783	1.0000

*Homogeneity of Variance did prevail.

Black Students Only			
Group	N	Mean	S.D.
1. Conventional	37	6.30	1.54
2. Medium Open	60	6.23	1.67
3. High Open	47	6.09	1.77

P < 0.831171

F-ratio = 0.19*

Homogeneity of Variance Test Chi-square = 0.7249
Prob. =0.6960

Probability Matrix for Scheffe Multiple Comparison of Means:

	1	2	3
1.	1.0000	0.9834	0.8466
2.	0.9834	1.0000	0.9017
3.	0.8466	0.9017	1.0000

*Homogeneity of Variance did prevail.

TABLE IV

VARIABLE: COHESIVENESS

White Students Only				Black Students Only			
Group	N	Mean	S.D.	Group	N	Mean	S.D.
1. Conventional	144	6.06	1.94	1. Conventional	37	6.19	1.91
2. Medium Open	127	6.44	2.36	2. Medium Open	59	6.31	2.01
3. High Open	136	6.09	1.94	3. High Open	47	6.34	1.94

P < 0.258223

F-ratio = 1.36*

Homogeneity of Variance Test Chi-square = 6.7740
Prob. = 0.0338

Probability Matrix for Scheffe Multiple Comparison of Means:

	1	2	3
1.	1.0000	0.3280	0.9947
2.	0.3280	1.0000	0.3896
3.	0.9947	0.3896	1.0000

*Homogeneity of Variance did not prevail.

P < 0.936177

F-ratio = 0.07*

Homogeneity of Variance Test Chi-square = 0.1312
Prob. = 0.9365

Probability Matrix for Scheffe Multiple Comparison of Means:

	1	2	3
1.	1.0000	0.9611	0.9404
2.	0.9611	1.0000	0.9958
3.	0.9404	0.9958	1.0000

*Homogeneity of Variance did prevail.

TABLE V

VARIABLE: DIFFICULTY

White Students Only				Black Students Only			
Group	N	Mean	S.D.	Group	N	Mean	S.D.
1. Conventional	136	3.41	1.68	1. Conventional	37	4.27	1.98
2. Medium Open	125	4.62	2.17	2. Medium Open	57	3.93	1.92
3. High Open	135	4.23	1.84	3. High Open	46	4.61	1.78

P < 0.000007

F-ratio = 14.00*

Homogeneity of Variance Test Chi-square = 8.6800
Prob. = 0.0130

Probability Matrix for Scheffe Multiple Comparison of Means:

	1	2	3
1.	1.0000	0.0000	0.0020
2.	0.0000	1.0000	0.2471
3.	0.0020	0.2471	1.0000

*Homogeneity of Variance did not prevail (adjusted F = 10.80 P. = .00005).

P < 0.196712

F-ratio = 1.65*

Homogeneity of Variance Test Chi-square = 0.4796
Prob. = 0.7868

Probability Matrix for Scheffe Multiple Comparison of Means:

	1	2	3
1.	1.0000	0.6959	0.7207
2.	0.6959	1.0000	0.1977
3.	0.7207	0.1977	1.0000

*Homogeneity of Variance did prevail.

TABLE VI

VARIABLE: TOTAL READING

White Students Only				Black Students Only			
Group	N	Mean	S.D.	Group	N	Mean	S.D.
1. Conventional	144	62.35	17.97	1. Conventional	37	38.84	18.62
2. Medium Open	127	57.76	17.32	2. Medium Open	60	41.85	17.26
3. High Open	137	63.34	18.18	3. High Open	47	41.50	16.12

P < 0.027096

F-ratio = 3.64*

Homogeneity of Variance Test Chi-square = 0.3331
Prob. = 0.8466

Probability Matrix for Scheffe Multiple Comparison of Means:

	1	2	3
1.	1.0000	0.1092	0.8964
2.	0.1092	1.0000	0.0409
3.	0.8964	0.0409	1.0000

*Homogeneity of Variance prevailed (adjusted F = 4.02 P = .03).

P < 0.683561

F-ratio = 0.38*

Homogeneity of Variance Test Chi-square = 0.8391
Prob. = 0.6573

Probability Matrix for Scheffe Multiple Comparison of Means:

	1	2	3
1.	1.0000	0.7064	0.7836
2.	0.7064	1.0000	0.9943
3.	0.7836	0.9943	1.0000

*Homogeneity of Variance did prevail (adjusted F = .63, ns).

TABLE VII

VARIABLE: TOTAL MATH

White Students Only

Group	N	Mean	S.D.
1. Conventional	144	67.81	18.55
2. Medium Open	127	66.51	17.06
3. High Open	136	72.10	20.02

$P < 0.038155$

F-ratio = 3.29*

Homogeneity of Variance Test Chi-square = 3.2984
Prob. = 0.1922.

Probability Matrix for Scheffe Multiple Comparison of Means:

	1	2	3
1.	1.0000	0.8482	0.1584
2.	0.8482	1.0000	0.0533
3.	0.1584	0.0533	1.0000

*Homogeneity of Variance prevailed (adjusted F = 3.55 p = .03).

Black Students Only

Group	N	Mean	S.D.
1. Conventional	36	43.11	18.06
2. Medium Open	59	53.46	18.21
3. High Open	47	49.57	16.69

$P < 0.024091$

F-ratio = 3.83*

Homogeneity of Variance Test Chi-square = 0.4261
Prob. = 0.8081.

Probability Matrix for Scheffe Multiple Comparison of Means:

	1	2	3
1.	1.0000	0.0241	0.2595
2.	0.0241	1.0000	0.5336
3.	0.2595	0.5336	1.0000

*Homogeneity of Variance did prevail (adjusted F = 4.79 P = .01).