AN INVESTIGATION OF THE EFFECTS OF FOUR CRITICAL THINKING PROCEDURES ON "CULTURALLY DISADVANTAGED" NINTH GRADERS

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Critical thinking has been a venerable and enduring objective of American public education. The enhancement of pupils' critical thinking as a desired learning objective, and as a citizenship objective has long been either explicitly or implicitly an objective of most teachers, disciplines, and professional education groups. Exhortation is often heard that students should be able to think logically, evaluate assumptions, arguments, and conclusions; define, interpret, infer, and predict; etc., in other words manifest the kinds of abilities often seen as making up the construct of critical thinking.

"Cultural disadvantagement" and "cultural deprivation" are labels which are now in vogue and are used to describe a large population of students characterized by the fact that they are not competitive in school, particularly in language associated activities. As this population has only recently received much systematic attention, there has been little effort to enhance the critical thinking skills of the "disadvantaged". However Whipple and Black (1966) suggest that instruction in critical thinking should be given to the "disadvantaged" and that the instruction should proceed from basic evaluations required to meet the needs of daily living, to higher levels of evaluation such as propaganda analyses. Since there is some evidence that poor, or lower social class people, many of whom are "disadvantaged" often are charged more for lower quality products it may be speculated that the "disadvantaged" need competency in critical thinking more than the "non-disadvantaged" populations.

RELATED LITERATURE

There has been a plethora of studies of ways in which critical thinking in some shape, form, or degree has been successfully "taught." Extensive reviews of these studies have been conducted by Ennis, Follman (1966), Harcourt, Brace and World, King and Ellinger (1967), and Russell (1960) among others.

One approach which has been used to enhance pupils' critical thinking has been student practice in propaganda analysis. Two classic studies in which student analyses of materials for propaganda were successful in enhancing the students' critical thinking skills were reported by Glaser (1941), and Osborn (1939).

Another approach which has been found to be effective in enhancing pupils' thinking is experience with programmed logic learning. Evans (1960) reported the successful use of this approach.

A third approach which has been found to enhance pupil thinking has been the application of the Rath's (1966) system of identification of facets of thought and values. Cartwright (1962), and Rothstein (1965) have reported evidence of success in improving student thinking after practice with this system.

These three approaches were used in this study. In addition a fourth approach, a games approach, The Propaganda Game was used. The games approach to teaching seems to be receiving some attention currently but there is little empirical evidence of the effectiveness of this approach, particularly independent evidence. Allen and Allen (1966) reported success in IQ change with a game approach to the learning of logic and/or problem solving using the WFF'N PROOF logic game.

There has been little direct empirical study of the relation between critical thinking and social class. Maw (1959), and Livingston (1965) found that the critical thinking skills of middle class pupils could be enhanced. It is probable that most of the pupils whose critical thinking skills were reported to be improved in the many studies referred to above, were middle class but this dimension has been infrequently examined empirically. Three studies which provide indirect evidence of the relation between social class and critical thinking were reported by Davis (1966), Ramseyer (1939), and Wiese and Cole (1960).

Davis (1966) found that pupils in upper socio-economic groups were superior to pupils in the middle and lower class in distinguishing between fact and opinion. Ramseyer (1939) in an investigation of factors influencing pupil attitudes found in paired comparisons of pupils with fathers of different occupational levels that generally the pupils whose fathers were on the higher occupational level manifested responses that were more critical than those of pupils whose fathers were of the lower occupational level. Wiese and Cole (1960) examined the effects of films in changing pupils' attitudes. Among the results was the apparent finding that minority group children manifested greater realistic thinking than pupils of higher social class.

The fact that few studies have been directly concerned with the relationship between critical thinking and social class and the apparent contradictory findings of the critical thinking skills of lower class pupils indicates that little is known about the relationship between social class and critical thinking particularly about the relationship between critical thinking skills and lower class children.

STATEMENT OF THE PROBLEM

The main purpose of this study was to determine the effectiveness of four approaches to enhancing the critical thinking of "disadvantaged" pupils. One approach was having students practice analyzing writings for examples of propaganda techniques. A second approach was pupil experience with The Propaganda Game. The third approach was pupil practice in analyzing writings for examples of facets of thinking according to Rath's system. The fourth procedure was having pupils take the Scriven programmed Applied Logic text.

This study had two main objectives:

1. to determine the effects of four approaches to enhance critical thinking on three socio-economic levels.

2. to determine the pupils' affective responses to the four approaches to critical thinking.

PROCEDURE

Method:

Three types of schools were selected which were considered to be representative of the public schools in Hillsborough County, Florida. One type was schools serving primarily white middle class pupils. A second group was schools serving primarily "disadvantaged" integrated white and Negro pupils. The third type was schools serving "disadvantaged" Negroes. Within each population four schools were arbitrarily chosen to be representative of that population. Within each chosen school a method of enhancing critical thinking was randomly assigned to one of two ninth grade English classes taught by the same teacher. The other class which did not receive the treatment served as a control group. The modal sample size for each class was 31. Thus there were four methods and three socio-economic types with each school within each socio-economic type receiving one teaching method.

The treatments (teaching methods) were:

1. pupil practice in analyzing writings for examples of propaganda techniques

2. pupil experience with The Propaganda Game

3. pupil practice in examining writings for examples of Rath's (1966) facets of thinking, and

4. pupil experience with the Scriven programmed Applied Logic.

Each teacher was trained to effectively conduct his (her) critical thinking approach.

At the initiation of the critical thinking experience the teachers also initiated new units for the control groups and advised both groups that they would have special experiences which were designed to enhance their critical thinking and that they would be tested to determine if these experiences did enhance their critical thinking skills. All the treatments were conducted during regular class time and all were completed within a month, with most taking about three weeks.

Flesch formula reading difficulty levels were determined for The Propaganda Game, and Scriven's Applied Logic. The analysis of The Propaganda Game indicated a difficulty level appropriate for junior high and also senior high school. The analysis of Scriven's Applied Logic indicated difficulty levels primarily at the junior high level with others at the senior high level.

The teachers were modestly compensated for their additional training, teaching, and administrative responsibilities.

Instruments:

The Watson-Glaser Critical Thinking Appraisal: Form Z, and the Logical Reasoning Test: Part I were administered as pretest measures and the Watson-Glaser: Form YM, and the Logical Reasoning Part II were given as posttest measures.

In addition a five item affective measure was given to obtain evidence of the pupils' attitudes toward the respective critical thinking approaches. The first item questioned if the student liked the particular critical thinking approach, very little, some, or very much. The second item inquired if the student would recommend the particular critical thinking approach, yes, don't care, or no. The third item inquired if the student thought the particular approach helped him think more logically, very much, some, or very little. The

fourth item inquired if the student thought the particular approach was hard, not hard nor easy, or easy. The fifth item inquired if using the particular approach was very interesting, somewhat interesting, or not interesting at all.

Statistics:

Three analysis of variance (ANOVA) designs were employed to analyze the data of the five Watson-Glaser subtests, total score, and Logical Reasoning Test scores.

A 3 x 4 x 2 ANOVA model was used to analyze levels of socio-economic status, approaches to critical thinking, and pre to posttest gains on the Watson-Glaser subtests and total test means, and also on the Logical Reasoning Test means.

A 3 x 5 x 2 mixed (between and within) ANOVA model was used to analyze means of levels of socio-economic status, approaches to critical thinking, and pre to post gains on the Watson-Glaser subtests' and total test scores. Since the experimental and control classes were nested within schools one control class was randomly selected from each socio-economic level and included as a fifth treatment. See Winer (1962) p. 184.

A quasi F ratio (F") was constructed to test the effect for change for the 3 x 4 x 2, and the 3 x 5 x 2 above ANOVA models. See Winer (1962) p. 199.

A 3 x 4 x 2 x 2 mixed (between and within) ANOVA model was used to analyze mean scores of socio-economic levels, approaches to critical thinking, experimental and control group differences, and pre to posttest crude gains on the Logical Reasoning Test. One control group from each socio-economic level was randomly selected for a fifth treatment.

Chi square analyses of individual items of pupils' attitudes toward their respective critical thinking activity were run to determine if there were differences associated with socio-economic level.

RESULTS

The 3 x 4 x 2 ANOVA first analysis indicated significant differences obtaining on two of the Watson-Glaser subtests, Recognition of Assumptions, and Interpretation. There was a significant (.05) gain from pre to post on the Assumptions subtest as measured by the quasi F ratio. This significant quasi F appears to be a function of a high A x

B x C interaction component. To the knowledge of this investigator the bias of the quasi F ratio as a statistic to approximate the F ratio when the A x B x C interaction is large has not been investigated. A significant (.01) interaction obtained between socio-economic levels and critical thinking teaching approaches on Interpretation as measured by the F ratio.

The 3 x 5 x 2 ANOVA second analysis indicated significant (.05) differences by socio-economic level for the Inference subtest and the Watson-Glaser Deduction subtest as measured by the F ratio. There also were significant (.05) differences in gains, for the Watson-Glaser Deduction, and Interpretation subtests, and significant (.01) differences for the Watson-Glaser Inference subtest as measured by the quasi F ratio. Table I illustrates the variance breakdown for the 3 x 5 x 2 analysis for the Watson-Glaser Inference subtest. The other tables are available upon request and would have been displayed but were not presented because of space limitations.

Table I

Summary ANOVA Table for Watson-Glaser Inference Subtest

Sources	df	SS	MS	F	F"
Between Groups	14	64.61			
SES (A)	2	32.59	16.30	6.20*	
Treatment (B)	4	11.01	2.75	1.05	
AB	8	21.01	2.63		
Within Groups	15	22.95			
Testing (C)	1	14.59	14.59		21.59+
AC	2	.35	.18	1	
BC	4	2.11	.53	1	
ABC	8	5.90	.74		
Total	29	87.56			

* p .05
\+ p .01

Significant (.05) differences for socio-economic level were found in the 3 x 4 x 2 x 2 ANOVA analysis for crude gains on the Logical Reasoning Test as measured by the F ratio.

Two chi square analyses were conducted on the five affective items individually. One analysis was the computation of five 3 x 3 chi squares, each an analysis of the three responses to each item by the three socio-economic levels across the four approaches to the enhancement of critical thinking to determine if there were differential attitudes by socio-economic levels. All of these chi squares were significant at, at least the .05 level indicating differential attitudes with socio-economic level.

The other chi square analysis was the computation of twenty 3 x 3 chi square analyses of the three possible responses for each item by the three socio-economic levels. These analyses were an examination of each of the five items within each of the four methods. Nineteen of these analyses were significant at, at least the .05 level indicating differences in attitude associated with socio-economic status.

Inspection of the data from these two analyses indicated that the socio-economic differences reflected generally more positive and neutral responses by both the white middle class level, and the lower class Negro level, while the attitudes of the lower class white and Negro level were generally negative and neutral. There were consistent neutral responses to the item about the difficulty level of all of the critical thinking procedures across socio-economic levels.

Also these data provide indirect evidence of the pupils' preferences for the four critical thinking approaches. The Propaganda Game, and the Scriven Applied Logic appeared to evoke the most favorable affective responses with the propaganda techniques next, and the Rath's system last.

CONCLUSIONS

Three general conclusions seem to be suggested by the results of this study. Initially it would appear that a relatively brief experience with purported critical thinking enhancement procedures is not likely to produce substantial improvement in critical thinking although it may effect improvement in some or all of the different components of the composite of critical thinking. This conclusion is documented by the fact that significant gains did not occur on Watson-Glaser total test score but did occur on four of the five Watson-Glaser subtests.

The second general conclusion is that socio-economic status plays an important and differential role in critical thinking performance. The performance of the white middle class pupils tended to be either equivalent or superior to that of the integrated Negro and white "disadvantaged"

pupils, and both of these groups tended to perform better on the critical thinking tests than the Negro "disadvantaged" pupils. Reading difficulty may be a factor here. The reading difficulty analysis indicated that while most of the Applied Logic and Propaganda Game selections analyzed represented junior high reading level, some were on the senior high level. Analysis of the handouts used for identification both of the propaganda techniques, and Rath's facets of thinking also indicated a range of reading difficulty level. It is probable that some of the reading material was too difficult for pupils particularly those in the two "disadvantaged" samples and that this may have inhibited their performance on the critical thinking measures.

It is anticipated that the relationship between critical thinking and socio-economic status, the relationship between critical thinking and language ability, and the relationship between language ability and socio-economic level will be examined intensively in a future study.

The differential and paradoxical affective socio-economic responses are also relevant here. Negro "disadvantaged" pupils manifested responses towards their respective critical thinking activities which were comparable in approval to those of the white "non-disadvantaged" pupils. The responses of both of these samples were more favorable than those of the Negro and white "disadvantaged" pupils. It is interesting that the "disadvantaged" Negro pupils who performed less well than the Negro and white "disadvantaged" indicated much more favorable attitudes. This is difficult to interpret although it may be speculated that some sort of Hawthorne Effect may have operated inducing the Negro "disadvantaged" pupils to indicate more favorable attitudes perhaps because of the special nature of the critical thinking experience. It may also be speculated that the attitudes of the "disadvantaged" Negroes and whites were less favorable perhaps because of idiosyncratic teacher behavior which may have influenced the pupils. Affective data from the control groups which received regular learning units might have provided evidence relevant to this question. Unfortunately this data was not collected.

The third major conclusion is that the Scriven Applied Logic, and The Propaganda Game seem to be preferred to the experience of analyzing materials for propaganda techniques, and that the Rath's system of identifying facets of thinking and values was least preferred. There is currently considerable interest in both the programmed approach, and the games approach to learning emanating from the rationale that these approaches enhance pupils' motivation. The evidence from this study, while only suggestive since no student group had experience with more than one approach, is empirical rather than hortatory like most of the evidence in support of the

games approach, and does support this rationale. There is of course considerable other empirical evidence for the efficacy of programmed learning in enhancing motivation.

In conclusion it is suggested that future studies be concerned with the effects of more extended activities designed to enhance critical thinking particularly for the "disadvantaged" and that the relationship between critical thinking and socio-economic status be investigated as well as the relationship between critical thinking and language skills. Suggested extended approaches for the enhancement of critical thinking include the inductive approaches, such as Suchman's Inquiry approach and also the Piaget approach as being experimented with in the New York City public schools.

SUMMARY

The objective of this study was to investigate the effectiveness of four methods of enhancing the critical thinking of three samples of junior high school pupils: white "non-disadvantaged"; white and Negro integrated "disadvantaged" and Negro "disadvantaged." The four methods of enhancing critical thinking were: student practice in identifying facets of thinking according to the Rath's system; experience with The Propaganda Game; and experience with the Applied Logic programmed text. Analyses of variance indicated significant differences for gains, and socio-economic level for several of the Watson-Glaser subtests, and also gains on the Logical Reasoning Test. Affective data indicated preferences for the various treatments differentially with socio-economic status. Some evidence appeared as justification that the games approach, and programmed learning are favorably received by students.

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