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ABSTRACT

Limitations of past research on college teaching and a recent exploratory study are considered. The study focused on the degree to which teachers encourage, praise, or use student ideas: the degree to which teachers ask questions that encourage evaluative and divergent thinking: the degree to which students make higher levels of cognitive responses: and the degree to which there is peer interaction in the class. Twelve faculty members known for a variety of teaching styles in a variety of disciplines were studied. Questionnaires were distributed to students at the beginning and end of the semester, class sessions were tape recorded, and questionnaires were distributed to the faculty members. Though an adequate range of behaviors was observed across the 12 classes, less than 20 percent of class time was spent in student participation or in encouraging involvement. Student participation, encouragement, and peer-to-peer interaction were rather consistently and positively related to the outcomes under consideration (perceived value of the course in stimulating additional intellectual pursuits, critical thinking scores on the Watson-Glaser test, and increased time spent while studying in analyzing, synthesizing, and evaluating materials). Implications for research, faculty development, and teaching are considered. References and a sample questionnaire are included. (SW)

AERA Panel: College Instruction: Four Empirical Views

Instruction and Outcomes in An Undergraduate Setting

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My interest in research on college teaching began with questions concerning the processes and the outcomes of instruction. Unfortunately no one study, not even the one I will describe, can give a simple answer to this concern. What I would like to do today is to broaden the context of my research and address three topics:

1. the need for greater research of this type today.
2. the results of my research as they relate to questions of teaching.
3. the implications of this study both for research and for instruction.

Educational researchers and theorists alike have been concerned about effective teaching and instructional techniques for decades. The current fiscal crisis in higher education lends an urgency to these concerns. With declining enrollments one obvious alternative for dealing with the financial problems of an institution is to improve its quality and thereby increase its attractiveness (Group for Human Development in Higher Education, 1974; Leslie & Miller, 1974; Shulman, 1974). One means to improving the attractiveness of the institution is the continued improvement of the quality of teaching and it is clear that such efforts are receiving increased attention in the form of a wide array of Faculty Development programs, and proposals for innovation and change in teaching (cf. Freedman, 1973; Group for Human Development in Higher Education, 1974).

I am struck, however, by the relatively narrow base on which many of these programs rest. Two primary directions appear to be common in faculty development programs. One is based on an assumption that research in one's discipline is the best way to improve one's teaching. Often this takes the form of allocating

money for sabbaticals to give faculty time off to do research in their subject area. The other direction involves the use of audiovisual and personal development techniques, involving one's colleagues or a faculty development "expert" (and I use that word in quotes), to give faculty feedback about their teaching. While many of these efforts seem logical, and do indeed have merit, I have much concern that they rest primarily on those intuitive notions we all carry around about what makes an effective teacher. Unfortunately, we don't all agree on what makes learners learn. As a result, the nature of the faculty development program at any given institution depends to a large degree on the person in charge and the design of the system. If the department chairperson controls the funds, the emphasis may be rejuvenation in the form of additional research in the person's subject area. If a humanistic psychologist is involved, emphasis may well be on personal style, feelings, and inter-personal relations.

If a faculty development program is simply intended to be a symbolic statement that the institution is committed to teaching, then the form and assumptions of the program don't matter very much--what matters in that case is that such a program exists. If, however, the primary purpose is to aid in the improvement of teaching, then the substance and form of the program are crucial. The problem in this second approach, however, is that we really don't know what factors and what elements are involved in good teaching.

Research results have been so limited that what we can report to faculty and to their institutions is of little use in efforts to improve teaching and few faculty development programs have research components.
As a result, intuitive notions of effective teaching are the foundations on which present faculty development efforts must rest. Now in a time when the need for empirically based information is even more crucial to the effectiveness and survival

of institutions, it is important to study more carefully and adequately the process of instruction. The research developed for the present study evolved both from a theoretical perspective and from perceived inadequacies in past research.

Limitations of past research

In much of the past research dedicated to assessing the differential impact of a variety of instructional techniques, researchers typically assessed whether the use of different methods such as lecture or discussion resulted in different student performances as measured by test results or grades. The lack of many significant findings has led some in the field to conclude that teaching method makes no difference (Bloom, 1963; Coladarci, 1958; Dressel & Mayhew, 1954; Macomber & Siegel, 1960; McKeachie, 1963). However, others have concluded that limitations in traditional research approaches may be responsible for the failure to find meaningful differences between teaching methods (Centra, 1972; Gage, 1967; McKeachie, 1974; Rosenshine, 1973). Indeed, where individual student characteristics have been considered and where more varied and sensitive sets of performance criteria have been used, some differences have been found in teaching method (McKeachie, 1970), but the results of such research have not been overwhelmingly powerful or consistent.

In looking at past research, it appears that the concept of "method" has rarely been questioned. As one reviews the instructional literature of the past two decades one sees the continued and prominent use of "lecture" and "discussion" methods as the primary independent variables of many instructional research programs. The risk of depending upon such molar or gross concepts to study instruction is highlighted by Bellack's (1967) finding that in comparing classes described as either "lecture" or "discussion" the ratio of time the teacher talks to the time the students talk was nearly the same. Perhaps these terms have better described

the perceived structure of the classroom than the actual behaviors which occurred. An alternative strategy to describe the process of instruction is to consider more molecular behaviors which occur in the classroom (Gage, 1967; Rosenshine, 1973). Such behaviors as questioning patterns, types of student interaction, or even total time students talk need to be considered. It is this approach which forms the basis of my own research.

Many psychologists are coming to the view, in fact, that we will never adequately understand group phenomena, of which a classroom is one, unless we study the interaction of inputs, intervening behaviors, and outcome. They point out that most studies use the "black box" approach of measuring initial characteristics and outcome, and then make inferences about the causal chain which links the two. McGrath and Altman (1966), two group psychologists, conclude that "too little attention has been given to systematically establishing the links in this complex chain. What has been done is to explore relationships between initial inputs and final outputs with insufficient attention to the ways in which input characteristics enchance or hamper final output via intermediate processess" (p. 65).

The present study

In order to investigate a view of teaching which would take into account the complexities of human behavior including individual differences in students and faculty and specific behaviors which occur in the classroom, I designed and developed an exploratory studey to look at instruction in terms of a complex scheme of student and faculty characteristics, actual classroom behavior and outcomes. Figure A illustrates the general nature of the scheme.

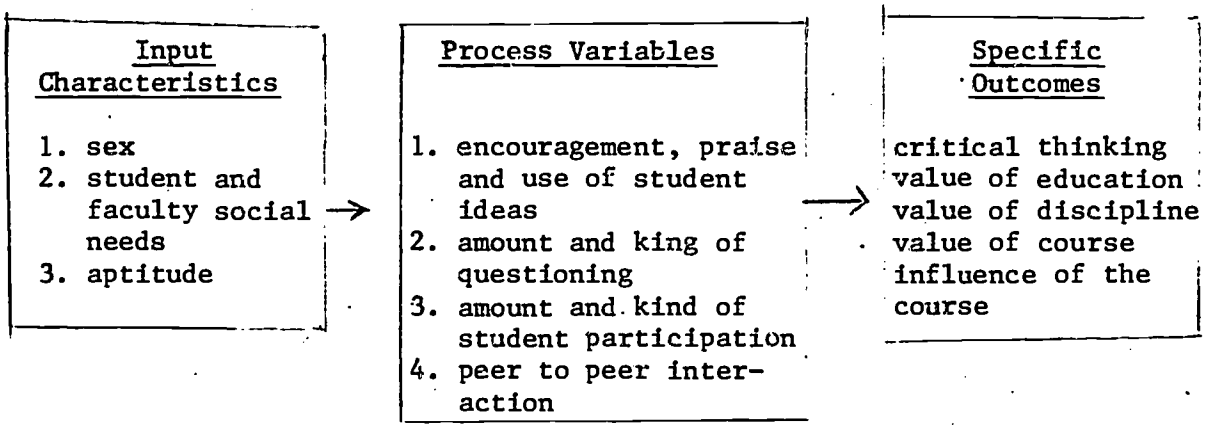

Figure A. Input, Process, and Outcome Variables

The central question was whether specific kinds of behaviors make any difference in terms of a varied array of outcomes. It is really the classic question--does method make a difference--posed in the context of a much more precise and complex model. You can see here potential for more interactions and meanings. The purposes of the study were first to increase out knowledge about instruction, by way of such a schema, and second, to try an approach which involves faculty and gives them feedback about the impact and style of their own teaching.

Because it was impossible to investigate all classroom behaviors and because active involvement of the student in the learning process is one of the least disputed factors in learning, I chose to look at faculty behaviors which attempt to elicit active involvement of the student, and student behaviors which are indicants of that involvement. Four activities were identified as being related to involvement and were the focus of the analysis:

1. The degree to which teachers encourage, praise or use student ideas.
2. The degree to which teachers ask questions which encourage evaluative and divergent thinking (that is, thinking which evaluates and explores new areas).

3. The degree to which students make higher levels of cognitive responses.

4. The degree to which there is peer interaction in the class.

The concern here is for specific process behaviors and not molar structural approaches. Fortunately, there are numerous process instruments available which can be used as is or modified to be suitable to describe and analyze behaviors which occur in the classroom. Bloom's Taxonomy of Cognitive Objectives (1956) can be applied to measure the increased sophistication of student responses. In addition, I used the Amidon-Flanders (1967) Modified Category System which enables one to describe not only frequencies of given types of behaviors, such as questioning, but also allows one to describe typical patterns of behavior. One can see, for example, whether a faculty member's question is usually followed by a faculty lecture or by a student response, and the length of time which separate the two. (Figure B) Uncovering such patterns has proven to be extremely helpful in giving feedback to faculty. My basic data about classroom behaviors came from tape recording and then analyzing four class sessions according to these category systems. Essentially, I made note of every type of behavior occurring at 3-second intervals or less. Such detailed analyses are fraught with many difficulties (including the tedium of analyzing every three seconds of classes ranging from 45 minutes to one hour), but they are essential if we are to understand fully the teaching-learning process.

Because aptitude, need for affiliation, and sex have been found to be major factors in achievement and level of student satisfaction, these three were the major input variables considered in the study.

One of the most difficult aspects of instruction to study is the outputs or measures of effectiveness. As a result, researchers have tended to

concentrate solely on knowledge acquisition, or on reports of student satisfaction. Clearly, if we are to involve faculty, we must also begin to conceive and develop other ways to measure the variety of outcomes about which we are concerned. Grades are clearly not adequate. The Carnegie Commission recently identified critical thinking, skill development, independence of learning, active participation in society and development of aesthetic and ethical values as other kinds of goals often identified with education. Not all of these are seen as goals of instruction, however. Knowledge acquisition, critical thinking, and skill development are closely related to intellectual development and are and would be the most widely agreed upon functions of instruction. However, instruction is also meant to contribute to the student's independence of learning. To do this, one might say that the student must value his or her education and what he or she is learning. Because in this study we did not have control over examination procedures and because knowledge acquisition has been studied so often, knowledge acquisition was not a focus of this study. Instead critical thinking and perceived value or learning were the central outcome variables of interest.

One of the major limitations of such a study as to be in the effectiveness with which we can operationalize such factors as critical thinking and value of learning. It is clear why grades have been used so often--they are simple to obtain. For this study I attempted to use some available inventories and to test their usefulness. To measure critical thinking I used the Watson Glaser Test of Critical Thinking, given before and after the study began, and a scale developed by Arthur Chickering. The Test of Critical Thinking incudes

three subscales which attempt to assess through reading the student's ability to discriminate the truth or falsity of inferences, to generalize from data supplied, and to evaluate arguments for or against a proposition. The Chickering scale asks each student to report the percentage of time they spend in such activities as memorizing, analyzing, interpreting, applying, synthesizing, and evaluating materials while they study. It was developed by Chickering and based on Bloom's Taxonomy of Cognitive Development. (Figure C) The assumption is that if students are not involved in critical thinking activities when studying they are less likely to develop those skills in the end. This approach proved valuable both for the research and the faculty participants because it had an intuitive validity that the standardized tests rarely have. The two different measures also served as cross validating instruments. To measure valuation of learning and education, several inventories were developed to measure the degree to which the student valued the subject matter under study and his or her education, in general. Most of the instruments described here had proven useful in studies assessing collegiate environmental impact.

With this scheme in mind, twelve faculty members known for a variety of teaching styles in a variety of disciplines were solicited for their participation. Their commitment involved allowing me to distribute questionnaires to students at the beginning and end of the semester, allowing me to tape record four class sessions distributed over the semester, and filling out one faculty questionnaire. To my surprise and relief, all the faculty approached agreed to participate. Some were skeptical while others were enthusiastic, but all agreed. So despite my feelings that faculty members

would be resistant to such approaches, I found the contrary. One factor which appeared to be significant here was that I was not a stranger to the faculty and had their respect. Obviously, those seen as interested and concerned with the teaching process are more likely to get the cooperation of faculty. The twelve classes were divided among the humanities, social sciences, and sciences and ranged in size from 10-38.

Students, too, were surprisingly willing to cooperate, even though the research required 1½ hours of their own time outside of class during particularly difficult periods of the semester. Almost 70% of those enrolled (148) in the classes participated!

Analysis

Change scores. Because of the problem of self-selection in the current study, pretest and posttest measures were obtained on the Watson-Glaser test. The self-report measures of behaviors could only be obtained at the end of the course. The precise way in which change scores should be treated, however, is the subject of much controversy and at least four methods have been suggested (cf. Cronbach & Furby, 1970; Harris, 1963).

Kenny (1975) reviews each of the alternatives and suggests that the appropriate approach depends, to a large degree, on the mode of selection into groups. Because students select classes on the basis of their interest or other such factors, it is felt that the present study fits into the catelgory described as "selection based on group differences." Because of this, standardized change scores were used in the current research.

In the case of the Watson-Glaser test, in which random-half methods

were used for the pretest and posttest, standardization occurred for each form of the test as well, resulting in the standardization of four groups (Thorndike, 1971).

Unit of analysis. One of the difficulties in statistical analysis in a study such as this one, in which both individual and classroom characteristics are being studied, is that the appropriate unit of analysis is not always clear. Past research has been frequently criticized for using class means as outcome measures, thereby ignoring individual differences (Berliner & Cohen, 1973). Yet to consider the individual subject as the unit of analysis poses a problem, since we cannot assume that the error is distributed randomly. All students in a given class may be affected by the climate or behaviors occurring in the class. Because there was no easy way to avoid the problem, data using both methods of analysis were frequently employed. Thus, some boundaries were established with regard to efforts introduced by using the subject or the classroom alone as the unit of analysis.

Multivariance procedures. Researchers in both psychology and education have recently been advocating the use of multiple measures in conducting field research (Glaser, 1973; Helmreich, Bakeman, & Scherwitz, 1973). Such an approach tends to acknowledge, statistically as well as conceptually, that the situation under study is a complex one.

The need to use multivariance procedures is essential, since the number of univariate analyses otherwise required tends to result in more frequent ad hoc and chance occurrences of significance. However, in order to facilitate interpretation, both multivariate and univariate analyses were employed.

In particular, canonical correlations were employed to test the overall relationship between two sets of variables. In this way, the pattern employed in traditional analysis of variance procedures were followed. Only upon finding a significant overall R did I perform additional, more specific analyses.

Results

What I would like to do now is share the results, but spare you the complex statistical analyses. I would be happy to share these with anyone interested. I might add here that in every case I erred on using conservative statistical approaches.

Though an adequate range of behaviors was observed across the twelve classes, the overall level of student involvement was quite low. Questioning occurred only 2.6% of the time and student participation only 14.2%. In total, less than 20% of class time was spent in student participation or in encouraging involvement. There is some indication from others on the panel that this figure compares to other college classrooms. In addition, Flanders (cited in Amidon & Hough, 1969) has indicated that for high school classes, student participation alone often accounts for 17% to 26% of class time. The active intellectual interchange, which one often imagines when envisioning a college classroom, does not take place <u>on the average</u>. This varied quite considerably among the classes, however, with student participation occupying over one-third of class time in one class. The narrow range observed for the questioning behavior might account for the lack of any consistent relationships between questioning and the outcome variables in contrast to the striking patterns

observed with the other process variables.

Students generally held positive views toward the classes as a whole and on values toward education and the discipline. Such findings may reassure faculty that students in general believe that what they are doing is somewhat worthwhile.

The most striking results emerged from the relationship between classroom behaviors and outcomes. A consistent pattern was found between three main behaviors and the outcome variables. Student participation, faculty encouragement and use of student ideas, and peer to peer interaction emerged as positively related both to affective outcomes such as influence, perceived value of the course and increases in valuing the discipline, and, more importantly, to change in critical thinking and critical thinking behaviors. Canonical correlations, univariate correlations and multivariate analyses of variance were the statistical methods used to evaluate the data. Student participation, encouragement and peer to peer interaction were positively correlated (at a statistically significant level) with the perceived influence of the course on such activities as going to lectures, reading additional materials, discussing issues and increasing curiosity. Moreover, these behaviors were also significantly related to changes in critical thinking scores in the Watson-Glaser and increased time spent while studying in analyzing, synthesizing and evaluating materials. To further examine these relationships, classes were divided into low, medium and high levels for each of the classroom behaviors of interest and critical thinking differences between the groups were graphed. This first figure (Figure D) shows the relationship between three classroom behaviors and changes in critical

thinking scores. The second figure (Figure E) gives one a sense of the reported studying behaviors as a function of classroom behaviors, in this case participation.

Efforts at student involvement, then, might be encouraged not only for the sake of student contentment, but for cognitive benefits as well. The differences in critical thinking scores and in critical thinking behaviors between classes with low and high level participation were consistent and dramatic.

This relationship between process and outcome was apparently in every statistical analysis applied (I might add here that in all cases complex multivariate statistical approaches were used as the basis for the analysis. The figures I am using take simpler univariate relationships for the purpose of discussing the results.) Through interactions of individual characteristics and teaching behaviors were hypothesized, they simply did not occur. This is not to say that classroom results are not a function of individual characteristics as well as classroom behaviors, but using measures of aptitude, sex and personality, none were found in this study. Studies of other variables or more specific variables may result in discovering such effects. In my view, the call for more complicated and nonlinear studies of instruction in recent literature was, in part, the result of the absence of consistent findings when just "method" was studied, and one observed isolated interaction effects. The current research suggests that a more molecular behavioral strategy can reveal significant additive effects, and that speculation on the need for complex interaction models might be premature.

While interaction effects between individual characteristics and classroom behavior were not found, the role of individual characteristics cannot be minimized. In several of the multivariant analyses these characteristics, particularly aptitide, emerged as important. A combination of individual characteristics and classroom behaviors yielded a somewhat higher correlation than either one alone.

These results emphasize the importance of verbal participation. In support of those who suggest that students need not verbally participate to be involved, it does appear that behaviors which encourage thinking instead of listening are also important. Students were asked to report on the time they spent listening, thinking, working, participating and doing unrelated things during the class period. Thinking was most consistently related to many of the affective and cognitive outcomes. Thinking was related to influence, perceived value of education and the value of the course. In addition, it was related to the four highest critical thinking behaviors.

However, thinking was also related to student participation. It may be that classes in which students are actively participating gave them more opportunity to think or were encouraging them to think. Such a finding suggests that verbal participation may be necessary for mental as well as verbal involvement.

The hypotheses with which this study was most directly concerned were generally supported. Student participation, encouragement and peer to peer interaction were rather consistently and positively related to the outcomes under consideration. Are we to say, then that, in general, the more of such behaviors the better? Are we to insist that teachers attempt to increase such behaviors in their classes? Because of research limitations

of an exploratory study of this kind, my response would be no. We must remember concerns for issues of self selection, curvilinear relationships, possible confounding and observer interference. However, if we were to ask whether the role of student involvement and faculty behaviors which encourage involvement should be carefully considered and perhaps encouraged, the answer must be yes.

In this light, these results and the form of this study do seem to have major implications for research and for faculty development and teaching.

Research implications.--The molecular measures and complex analyses used in this study clearly proved useful. The experience gained here should be useful in designing studies which are less exploratory and more controlled. I was excited by the apparent usefulness of a research approach about which even I was skeptical. For years now, psychology has called for more precise operationalization of terms and the more effective use of multivariant statistical approaches. Yet such approaches are still rare. This study reinforces the wisdom of this direction.

This study, as I mentioned, is not the total picture and I myself want to do further research which explores the individual faculty member's goals and variation among disciplines (which I found minimal in this research).

Implications for faculty development and teaching.--As stated earlier, this study was not intended to answer the question of how to teach. However, the results of this study do have some implications for faculty development efforts and for teaching.

The results do support the contention that classroom interactions can

have an impact on the outcomes of instruction. Moreover, within the general conceptualization of active involvement, there are specific processes which seem to be important. In particular, student participation, encouragement, praise and the use of student ideas and peer to peer interaction are important. Greater awareness of the research literature and greater consciousness of these processes in the classroom could greatly contribute to the imporvement of teaching.

The question of whether teachers should be trained to perform these behaviors is not addressed in this research. Indeed, research efforts which actually manipulate teacher behaviors have not been uniformly successful (Flanders, 1970). The mechanical performance of certain actions may not improve teaching. What may be more important are honest efforts to involve and stimulate students and greater consciousness on the part of teachers about instructional processes. In fact, a recent Change (1974) monograph on faculty development speaks to this point:

> Self reflectiveness about methods of teaching, however, is not strongly encouraged by faculty culture. This is ironic because most scholars are self conscious about the methods of their scholarship. . . At worst self reflectiveness can become a substitute for doing or concluding anything, but at best it is indispensable to the progress of disciplines. . . .
>
> In a similar spirit, professors and students could gain by reflecting regularly upon the process by which they think, teach, learn about these subjects. . . . Universities have an obligation to help their staff and students monitor their own intellectual history as it is being made . . . (p. 35).

The overall benefits of research such as this will lie first in its contribution to the accumulation of more and more refined studies of instruction

within instructional and educational psychology, and secondly, in its stimulation of reflectiveness about teaching and learning amoung the faculty and student participants. While in my experience most faculty are skeptical about such research results as it relates to their own teaching, the results of this study proved helpful to the faculty participants and to others on two levels. First, most faculty found the results themselves quite interesting. As I already mentioned, the more intuitively appealing scales of critical thinking behaviors were of greater interest than the test of critical thinking. Faculty members were interested in what students from their classes said about their study patterns and the relationship this had to classroom behaviors. Of even greater interest, however, was the information I was able to provide faculty about the actual behaviors and interactions which occurred in the classroom. One faculty member who had been discouraged by the kinds of student participation in his statistics class told me that he had tried to ask more questions with no apparent results. My empirical description of the classes I visited indicated, however, that he had asked very few questions and that when he did, he answered them himself within three seconds. The information was very significant for him.

Studies such as this have relevance in my view because of the process of the research as well as the results. It is my hope that the knowledge that instruction can be studied and that such studies can provide useful information may generate greater awareness about the proces of teaching.

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FIGURE B

MODIFIED CATEGORIES OF
THE FLANDERS' SYSTEM

Teacher Talk	1. accepts feeling	
	2. praises	
	3. accepts idea	
	4. asks	a) cognitive memory question
		b) convergent question
		c) divergent question
		d) evaluative question
	5. lectures	
	6. gives directions	
	7. criticizes	
Student Talk	8. pupil response	a) cognitive memory
		b) convergent
		c) divergent
		d) evaluative
	9. pupil initiation	a) cognitive memory
		b) convergent
		c) divergent
		d) evaluative
	10. silence	
	11. confusion or laughter	

FIGURE C

Different courses and classes call forth different activities during class meetings and different mental activities in study. For the two clusters which follow indicate the percent of time spent by writing the number of the most suitable option in the space opposite each activity. Because activities can overlap in time, percents need not add to one hundred.

1.5% or less
2.6%-20%
3.21%-50%
4.51%-80%
5.81% or more

What percent of your time is spent on the following activities during class meetings?

_____1. Listening to what is being said, primarily in order to remember (include taking notes if you do this)
_____2. Doing your own thinking about the ideas presented: analyzing, thinking of implications, checking for soundness, mentally criticizing, etc.
_____3. Actively working at desk problems or lab tasks relevant to the class.
_____4. Participating in discussion, making statements to the class, speeches, formal presentations.
_____5. Doing things unrelated to class: daydreaming, dozing, writing letters, reading, thinking about ideas for other classes, bullsessions, etc.

What percent of your time is spent on the following mental activities as you study for this course?

_____1. Memorizing: learning specific things, words, ideas, methods, so that you can remember them pretty much in the same form in which you encountered them.
_____2. Interpreting: mentally putting things in different terms, translating, reorganizing, making inferences or extensions of thinking based on principles given.
_____3. Applying: drawing upon a variety of concepts and applying them to new problems or situations.
_____4. Analyzing: analyzing material (data, literary works, argumentative or discursive material, etc.) into parts and detecting relationships among parts and ways they are organized.
_____5. Synthesizing: organizing ideas, or parts into new plans, relationships, or structures, as in developing plans for an experiment, writing a poem or essay, deriving principles from data, integrating information from diverse sources.
_____6. Evaluating: making judgments about the value of materials (concepts, evidence, theories, arguments, communications) and methods.

FIGURE D

LEVELS OF THREE CLASSROOM PROCESSES
AND
CHANGES IN CRITICAL THINKING SCORES