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ABSTRACT

This study sought to ascertain how teachers and students interpret non-verbal cues in the form of visuo-gestural channel expressions by having them assign affective meaning to such expressions depicted photographically. Subjects were 377 students and 19 teachers from two elementary schools: one, urban and characterized as low socioeconomic status; the other, suburban and characterized as high socioeconomic status. Nine emotional expressions were tested-fear, disgust, happiness, surprise, suffering, anger, contempt, determination, and joy. They become the stimuli for eliciting expressive affective meaning as interpreted by subjects through the adjective pair scales of the Semontic Differential. Independent variables were Status (teacher and student, and school socioeconomic level (SES). Results of data analysis indicate that depicted emotions of fears and anger elicited different interpretations from teachers and students, suggesting the need for teachers to know which kinds of non-verbal cues pupils tend to perceive as they do, and which they do not. Approved one subject information sheets and response sheets. (Author)

A Multi-Variate Analysis of Teacher-Student Interpretations of Non-Verbal Cues: The Measurement of Visuo-Gestural Channel Expressions

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Introduction

While research in quantifying and coding teacher-student interaction in the classroom is only two decades old, already tomes of information have been generated dealing with verbal interaction. Tremendous strides have been made in quantifying classroom verbal interaction by N. A. Flanders (1964), probably one of the foremost authorities in the area. Numerous other studies have led to sophisticated measuring instruments for teacher and student verbal behavior (Simon, 1968). The question arises; is the verbal behavior of the classroom a complete enough "picture" from which to draw inferences about teachers' and students' behavioral traits? Amidon and Flanders (1967) state: "The Flanders system . . . is concerned with verbal behavior only, primarily because it can be observed with higher reliability than can non-verbal behavior. The assumption is made that the verbal behavior of an individual is an adequate sample of his total behavior." This assumption

*This research is a continuation and extension of a doctoral dissertation by Teresa, Joseph G., The Measurement of Meaning as Interpreted by Teachers and Students in Visuo-Gestural Channel Expressions Through Nine Emotional Expressions, Unpublished doctoral dissertation, University of Michigan, 1971.

has guided and dominated educational research for some time. It has been challenged only in the last decade in the areas of anthropology, counseling, psychotherapy, and sociology as individuals within the separate disciplines have begun to study non-verbal communication seriously.

Birdwhistell (1952) and others have established that there are non-verbal cues or visuo-gestural channel expressions* which are emitted within the course of communication. They have also substantiated that these cues are important factors in the flow of communication between communicators. Ekman (1967) stated that "non-verbal behaviors . . . body movements of the organism which also consist of motor expressions though they may originate in various parts of the body." Ekman (1965) further stated that "all can occur simultaneously or separately, with or without speech, during an interaction or when an individual is alone, spontaneously or by contrivance."

This study sought to ascertain how teachers and students interpret non-verbal cues in the form of visuo-gestural channel expressions by having them assign affective meaning to such expressions depicted photographically.

Need for Study

Substantiating the need for the study of non-verbal communication,

*The authors use the term visuo-gestural channel expressions in the place of non-verbal cues to mean the overt visual body gestures and movements of an individual. These individual non-verbal cues can be combined into an overt visual behavioral act or non-verbal visuo-gestural expressions which have meaning to the interpreter.

Halpin (1960) states that ". . . to avoid the narrow view we must start by recognizing that man communicates to his fellow man with his entire body and with all his behavior."

Ruesch and Kees (1969) do not distinguish between intentional statements (verbal) and unintentional expressions in their definition of communication theory. They state: "Communication does not refer to verbal, explicit, and intentional transmission alone. . . . The concept of communication would include all those processes by which people influence one another. . ." This definition is based upon the premise that all actions and events have communicative aspects, as soon as they are perceived by a human being.

Mead (1934) concurs with the above believing that "language of gestures" (non-verbal) is an unconscious level of communication. "There is an indefinite number of signs or signals which may serve the purposes of what we term 'language.' We are reading the meaning of the conduct of other people when perhaps they are not aware of it. There is something that reveals to us what the purpose is . . . just the glance of an eye, the attitude of the body which leads to the response. The communication set up in this way between individuals may be very perfect. Conversation in gestures may be carried on which cannot be translated into articulate speech." Certainly the importance of non-verbal cues and responses to an area as dependent upon accurate interpersonal communication as is the teaching-learning process should fully justify intensive research.

Although Smith (1961) makes a distinction between teaching and learning, his remarks about the significance of teacher non-verbal behavior are relevant. He views teaching as a system of verbal and non-verbal actions that are directed to students. In his pedagogical model, linguistic behaviors are verbal; performative and expressive behaviors are non-verbal. For this study, Smith's account of the function of expressive behavior and its meaning is significant where he states: ". . . . These behaviors are illustrated in bodily posture, facial expression, tone of voice, expression of the eyes, and other ways . . . expressive behaviors function in teaching because they are taken by pupils as signs of the psychological state of the teacher."

Mitzel and Rabinowitz (1952) insist that non-verbal communication plays a substantial part in students deriving meaning from teachers' expressions. They state: "A teacher's posture, gestures and facial expressions undoubtedly convey meaning to children . . ."

Jourard (1958) notes that a person will continuously attempt to derive meaning from another person's non-verbal cues. He lists the most common bases employed for inferring the intentions and feelings of others: ". . . (a) observations of his facial expression, tone of voice, and gestures, which generally disclose what the person is feeling; and (b) observations of the instrumental action and its consequences; from the actions and consequences, the observer formulates hypotheses as to the need--tensions of the behaver . . . his aims, intentions, wishes, etc."

Studies indicate that individuals do transmit meaning through non-verbal cues which are integrated into an overt expressive non-verbal visuo-gestural channel expression. The findings further substantiate the notion that not all communication occurs at the verbal level. Non-verbal communication is an important element in the classroom. The teacher should be made aware of this as well as of the non-verbal expressions which he transmits to others. There is the task of measuring the individual's perception and interpretation of these visuo-gestural channel expressions into affective meaning.

In carrying out this research, the authors sought to answer several basic questions from which could be derived both hypotheses for further test and methods for testing those hypotheses. These were:

1. Can teachers and students identify non-verbal visuo-gestural channel expression by assigning affective meaning to them?
2. What affective meanings do these non-verbal visuo-gestural channel expressions have to teacher and student?
3. Are the affective meanings of these non-verbal visuo-gestural channel expressions similar for teacher and student?
4. Does the affective meaning as interpreted by teachers and students vary in relation to other demographic factors such as school, I.Q., sex, and grade level?

The original study from which the data presented here was gathered and analyzed both descriptively and univariately (item-by-item) (Teresa, 1971), answered clearly in the affirmative the original question about

whether assessing interpretations of non-verbal cues is possible for teachers and students. It also suggested clearly that the use of the Semantic Differential as an assessment device was both feasible and worth further study.* What could not be answered clearly enough was the question regarding the extent to which teachers and students respond similarly to the cues, nor the extent to which other factors influenced the similarity or dissimilarity of responses. Accordingly further analyses using multi-variate statistical techniques were undertaken on the original data and steps were initiated to secure funds for more thorough and detailed data-gathering.

This paper reports the results of the first multi-variate analyses, comments on the hypotheses they generate for further test, and on the subsequent analyses to which they lead.

Procedure

1. The Sample

Subjects for this study included 377 students and 19 teachers from the middle elementary grades of two different schools, one an urban school characterized as low socioeconomic status, and the other a suburban school characterized as high socioeconomic status. Middle level elementary students were chosen because of their ability both to understand a paper-and-pencil instrument and to communicate verbally

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*See appendix for sample of Semantic Differential scale used in the original study.

with the experimenter. Classes chosen to participate depended upon selection by the school principal and willingness of the teacher to participate. Hence they cannot be construed as either random or representative.

2. Data Collection

To gather data, the senior author developed a 16mm film of an actress depicting a teacher using various visuo-gestural channel expressions. Shown below is an illustrative diagram of the general data-gathering procedure

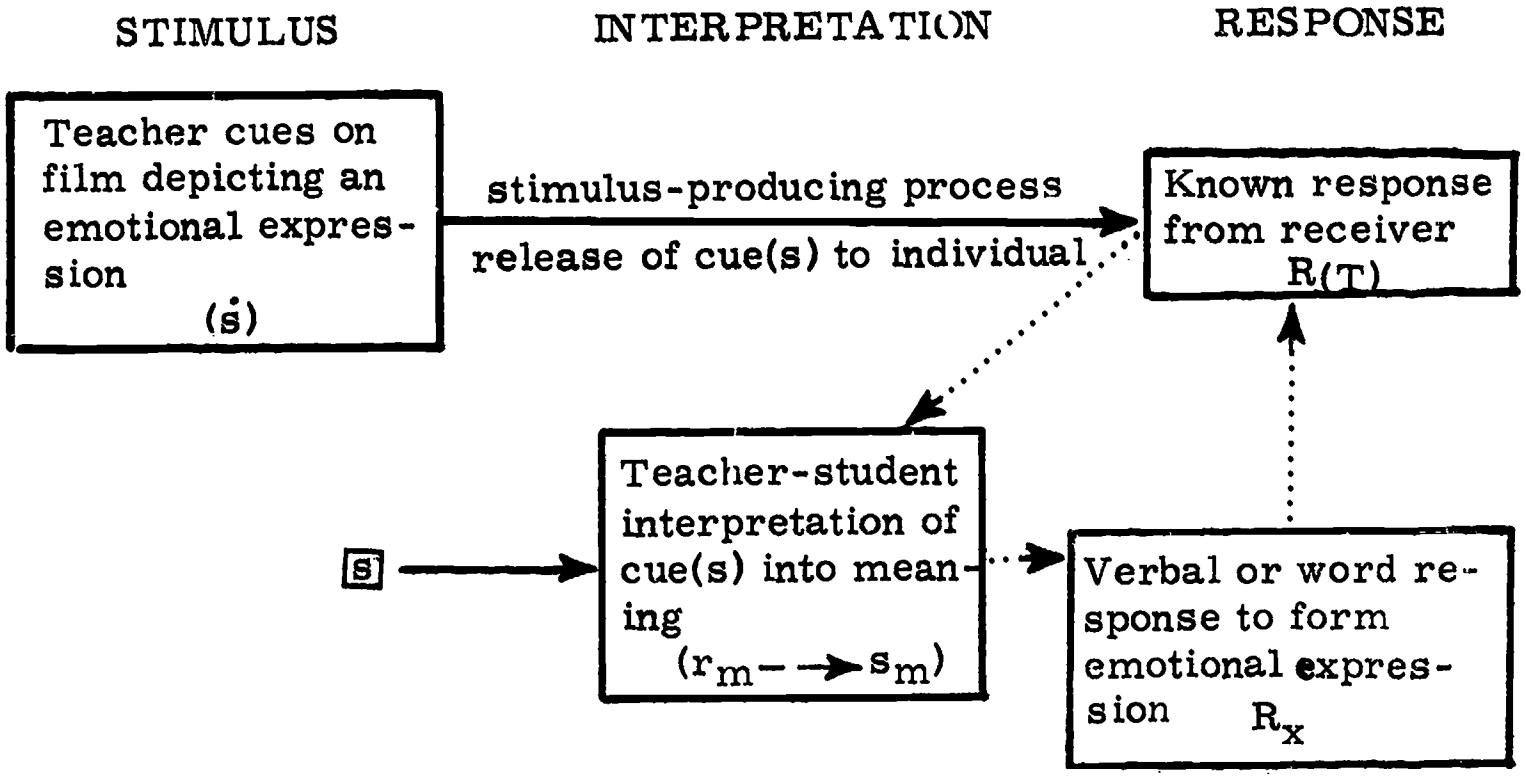


Figure 1. Theoretical Design of Study

Nine emotional expressions were used for this particular study, including fear, disgust, happiness, surprise, suffering, anger, contempt, determination, and joy. These were emotional expressions which had been correctly identified in previous studies. They became the stimuli for eliciting emotional, expressive affective meaning as

interpreted by teachers and students and recorded by each through the adjective pair scales of the Semantic Differential.

The emotions were presented in random order and the subjects responded with their interpretations of the meaning being conveyed.

The instrument used to measure affective meaning was the Semantic Differential as developed by Osgood (1957). The scales depicting evaluative and activity dimensions were taken from Osgood's and Block's (1957) work which showed a high degree of reliability between words and scales.

These factor scales included:

Evaluative Dimension		Activity Dimension	
Rotated Factor Loadings		Rotated Factor Loadings	
Good - Bad	.88	Relaxed - Tense	.55
Beautiful - Ugly	.86	Still - Active (Passive)	.59
Kind - Cruel	.82	Calm - Excitable (Agitated)	.61
Happy - Sad	.76		

3. Forms of Analysis

The data were analyzed by a two-way multi-variate analysis of variance according to procedures outlined by Bock and Haggard (1968) and programmed for computer by Finn (1968). The independent variables analyzed for this paper included STATUS (teacher and student) and Socio-economic Level of the School (Low SES vs. High SES). The classification considered of most importance a priori was that of STATUS because of the more central theoretical interest in whether or not teachers and students respond similarly to non-verbal cues. The factor of SES was

introduced both as a statistical control and because of an exploratory interest in the effect of socioeconomic variables on interpretation of non-verbal cues. Subsequent analyses along the lines presented here will explore the trend of responses to non-verbal cues across different school years (a possible maturation effect among students); and the possible effects of I.Q. differences on students' interpretations of non-verbal cues. A breakdown of the sample by the independent variables is shown in Table 1.

Table 1

Composition of the Sample

	Low SES School	High SES School	Total
Students	157	220	377
Teachers	10	9	19
Total	167	229	396

Because of differences in cell frequencies it was necessary to use a non-orthogonal analysis of variance which requires the ordering of tests of effects so as to remove confounded sources of variance. Table 3 shows the multi-variate tests of equality of mean vectors generated by this process for the Activity and evaluative scopes on all emotions.

Table 2

Estimated Means of Scales for Each Emotion Ignoring Non-Significant Interaction Effect

		Fear	Disgust	Happiness	Surprise	Suffering	Anger	Contempt	Determination	Joy	Fear	Disgust	Happiness	Surprise	Suffering	Anger	Contempt	Determination	Joy
Student	Low SES	2.97	2.84	2.24	3.32	3.39	4.12	2.68	2.95	2.81	4.24	4.13	1.74	3.71	3.85	4.40	3.47	3.76	1.44
	High SES	2.92	2.77	2.09	3.51	3.49	4.45	2.69	3.02	2.76	4.21	4.28	1.83	3.81	4.00	4.59	3.83	4.08	1.37
Teacher	Low SES	3.58	3.21	2.16	3.71	3.92	4.31	3.05	3.57	2.58	4.45	4.25	2.03	3.71	3.87	4.13	4.72	3.81	1.41
	High SES	3.54	3.14	2.01	3.91	4.02	4.65	3.06	3.62	2.53	4.41	4.41	2.11	3.81	4.03	4.32	4.09	4.14	1.34

*Note scales remain constant across emotional expressions--see appendix for scale used

Analysis

The extent and scope of data collected made univariate analysis both cumbersome and difficult to interpret. Accordingly, steps were taken both to reduce the dimensions of the data and to analyze it by multi-variate methods more capable of detecting and elucidating complex effects.

1. Data Reduction

Rather than treat all semantic differential scales separately for each emotion (an approach which had created a 9 x 8 matrix of 72 dependent variables), the authors accepted temporarily the results of Osgood's factor analysis which divided the scales according to an Activity dimension and an Evaluative dimension. Each subject's scores on the scales comprising these dimensions were averaged to yield, for each emotion, an Activity score and an Evaluative score. All scales were reflected prior to averaging so that low scores indicated a positive evaluation or a low level of activity, while high scores indicated a negative evaluation or a high level of activity.

It is recognized that this combination process assumes the applicability of Osgood's dimensions to an entirely different context and set of data. Though questionable, the assumption was tentatively accepted because of the tested reliability of his dimensions in other contexts (Osgood and Block, 1957). A full factor analysis and generation of factor scores for the resulting dimensions are presently under way and will be reported subsequently. It will provide both a further test

of the reliability of Osgood's dimensions and more sensitive variables for continuing analyses of these data.

Results

Table 3 shows that there is no interaction between the main effects of STATUS and SES ($P < .5752$). The next tests indicate that both STATUS (with the effects of SES and the General Mean removed) and SES (with the effects of STATUS and the General Mean effect removed) are significant. The results displayed in Table 3 are the result of two different orderings of tests of effects. Such reordering was necessary to obtain unconfounded tests of significance on both the STATUS and SES effects.

Table 3

Multivariate Tests of Equality of Mean Vectors
for all Emotions

Source of Variation		df	F-Ratio	P
General Mean ignoring SES, School, and interaction	Activity Scores	9, 384	3531.11	<.0001
	Evaluative Scores	9, 384	7017.48	<.0001
Status (Teacher vs. Student) eliminating the General Mean, and the effect due to school & ignoring NS interaction	Activity Scores	9, 384	2.38	<.0125
	Evaluative Scores	9, 384	2.30	<.0161
Socioeconomic Status of School, eliminating the General Mean & Student -Teacher Status Effect, ignoring NS interaction	Activity Scores	9, 384	2.85	<.0029
	Evaluative Scores	9, 384	5.79	<.0001
Interaction, eliminating the General Mean and the Main Class Effects	Activity Scores	9, 384	1.17	<.3143 ns
	Evaluative Scores	9, 384	.845	<.5752 ns

Having established the tenability of a non-trivial model, the next step is to estimate the effects of the individual factors. This proceeds by means of a non-orthogonal least-squares solution (Bock, 1968) resulting in the General Mean and Main Effect contrasts shown in Table 4. Tables 2 (Estimated Means) and 4, and Figures 1, 2, and 3 (at end of paper) give a general overview of the results of this study.

Table 4

General Means and Least Squares Estimates of Main Effects

	Activity Scores			Evaluative Scores		
	General Mean	Stud. vs. Teacher	Low SES vs High SES	General Mean	Stud. vs. Teacher	Low SES vs High SES
Fear	3.25	-.62	.05	4.33	-.21	.03
Disgust	2.99	-.37	.07	4.27	-.13	-.15
Happiness	2.12	.08	.15	1.93	-.30	-.08
Surprise	3.62	-.40	-.20	3.76	.00	-.10
Suffering	3.70	-.53	-.10	3.94	-.03	-.15
Anger	4.38	-.20	-.33	4.36	.27	-.19
Contempt	2.87	-.37	-.01	3.77	-.26	-.36
Determination	3.29	-.61	-.06	3.95	-.06	-.32
Joy	2.67	.23	.05	1.40	.03	.07

Considering the Activity and Evaluative Scores for all emotions, there appears to be significant differences in the way teachers and students interpreted the non-verbal cues. Teachers in general tended to perceive the emotions as more active. This was true for seven of the emotions with only Happiness and Joy being rated more active by pupils.

In the case of Happiness, the mean difference is so small (.08) as to be virtually non-existent. Evaluation scores show a more ambiguous pattern with teachers rating four emotions more negatively, students rating one emotion (Anger) more negatively, and both groups rating four emotions virtually the same.

A significant difference also appeared between the Low SES and High SES schools. For the Activity dimension the Low SES group rated Fear, Disgust, and Happiness as more active while the High SES group rated Surprise, Suffering, Anger, and Determination as more active, with Contempt, and Joy being rated virtually the same. On the Evaluative Scales, the High SES group rated Disgust, Surprise, Suffering, Anger, Contempt, and Determination as more negative while Fear, Happiness, and Joy were rated virtually the same. Figures 1 and 2 illustrate the differences between the Evaluative and Activity Scores for each emotion.

The multi-variate significant differences of the main effects can be clarified by Table 5 which displays the standardized discriminant function, coefficients of the emotions making the greatest contribution to the distinction between the different groups.

The discriminant coefficients indicate that for the Activity dimension, the best discriminations between teachers and students are Determination (-.5669), Fear (-.4544), and Suffering (-.3289), all of which teachers interpreted as more active. The best discriminators between High SES and Low SES schools are Anger (-.7365) and Surprise

Table 5

Standardized Discriminant Coefficients* for
Differences Between Contrast Groups

Emotion	Activity Dimension		Evaluative Dimension	
	Stud. vs Teacher	Low SES vs High SES	Stud. vs Teacher	Low SES vs High SES
Fear	-.4544	.1913	.5057	.5766
Disgust	.0327	.2856	.2690	-.1264
Happiness	-.0055	.2361	.3840	-.1877
Surprise	-.0719	-.4772	-.0039	-.0233
Suffering	-.3289	.0647	.2140	-.1019
Anger	.0053	-.7365	-.9502	-.5584
Contempt	-.(032	-.0466	.2869	-.3053
Determination	-.5669	-.0598	-.1365	-.4581
Joy	.1523	-.0407	-.2342	.1509

*Negative sign indicates that group to the right (Teacher, High SES) was more negative in evaluation and more active.

(-.4772), both of which the High SES Schools group rated as more active than the Low SES School group.

For the Evaluative Dimension the strongest discriminator between teachers and students is Anger (-.9502) which was less positively evaluated by teachers and Fear (.5057) which was less positively evaluated by pupils. The same two emotions, Anger (-.5584) and Fear (.5766) best discriminated between High SES and Low SES Schools--and in the same directions.

In summary, it seems that the emotions of Fear and Anger as depicted in the photographic stimuli elicited different interpretations from teachers and students, both in terms of the degree to which they were viewed as positive or negative and in terms of the degree to which they were perceived as more or less active. To a lesser extent Suffering is perceived by teachers as more active and Surprise is perceived as more active by those in the High SES Schools.

Perhaps even more instructive for purposes of the study is that:

1. On the Activity Scales the discrimination coefficients between teachers and students for Disgust, Happiness, Surprise, Anger, and Contempt are negligible.
2. The Activity Scale coefficients discriminating High and Low SES Schools for Suffering, Contempt, Determination, and Joy are negligible.
3. The discriminant coefficients for all but two of the emotions are very small on the Evaluative Scales.

This might indicate that for certain emotions teachers and students do in fact assign similar affective meanings. The implications of this would be that teachers would need to be more careful of communication in those non-verbal cues relating to Fear, Anger, Determination, and Surprise but could rely more on the congruence of their non-verbal cues for other emotions. However, the logical path of inference for any such conclusion applicable to the classroom is tortuous and would require not only further elaboration but further test. It may be that the similarities in reaction are of even more substantive significance than are the differences, for they may point toward communication potentialities hitherto untapped. It seems important for teachers to know which kinds of non-verbal cues pupils tend to perceive similarly with them and which they do not. If vivid emotions are not similarly perceived under no-threat condition, is there a greater or lesser tendency to perceive them similarly under actual classroom circumstances? This study certainly cannot answer such a question. It can only suggest that non-verbal communication can be studied empirically and must be studied sophisticatedly if useful information is to result.

The data base for this study has served and will continue to serve two major functions. First, it provides an opportunity to search for analytic tools and empirical constructs which can better handle the complexity of non-verbal data; and second, it can generate substantive questions to non-verbal cues, maturation, and intelligence. These analyses are being developed as efforts are being made to find funds for more detailed study.

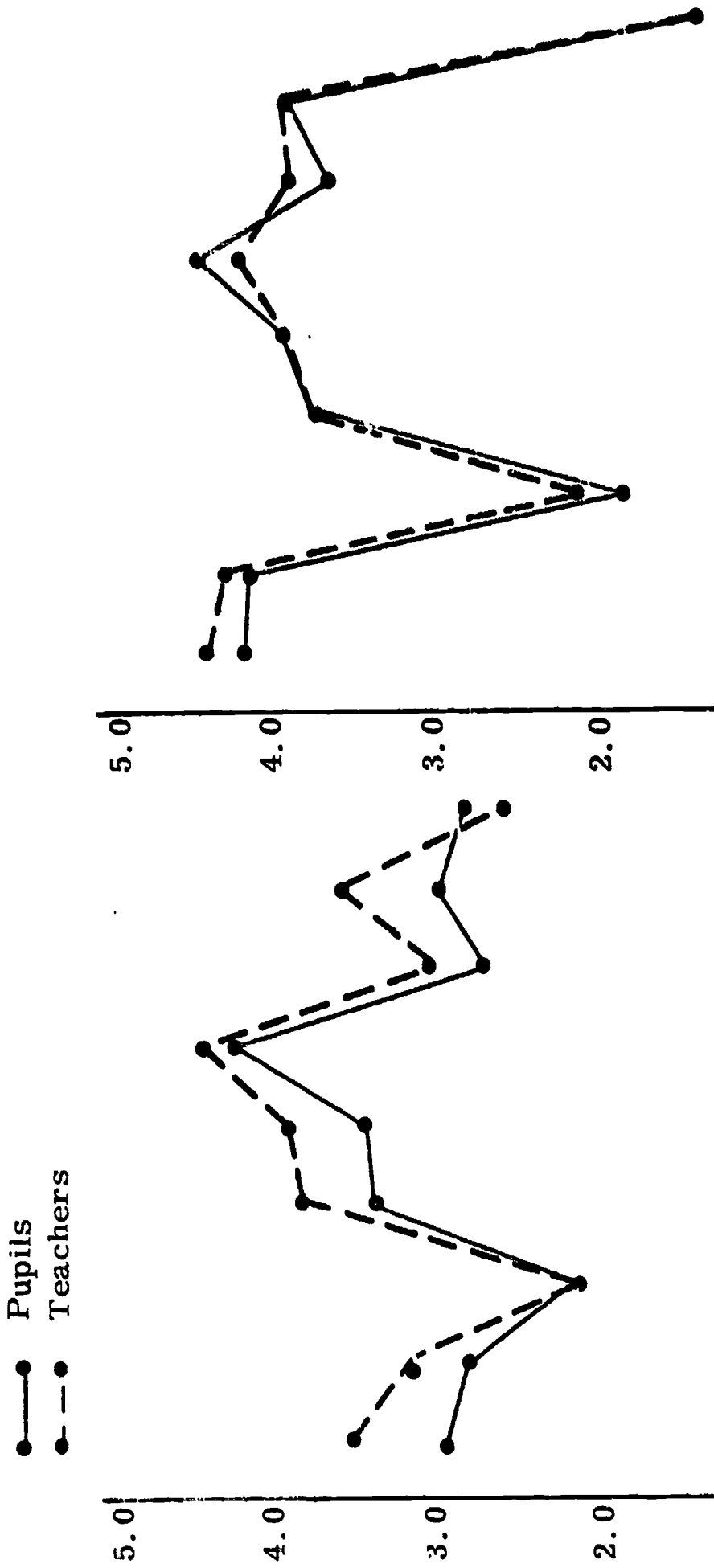
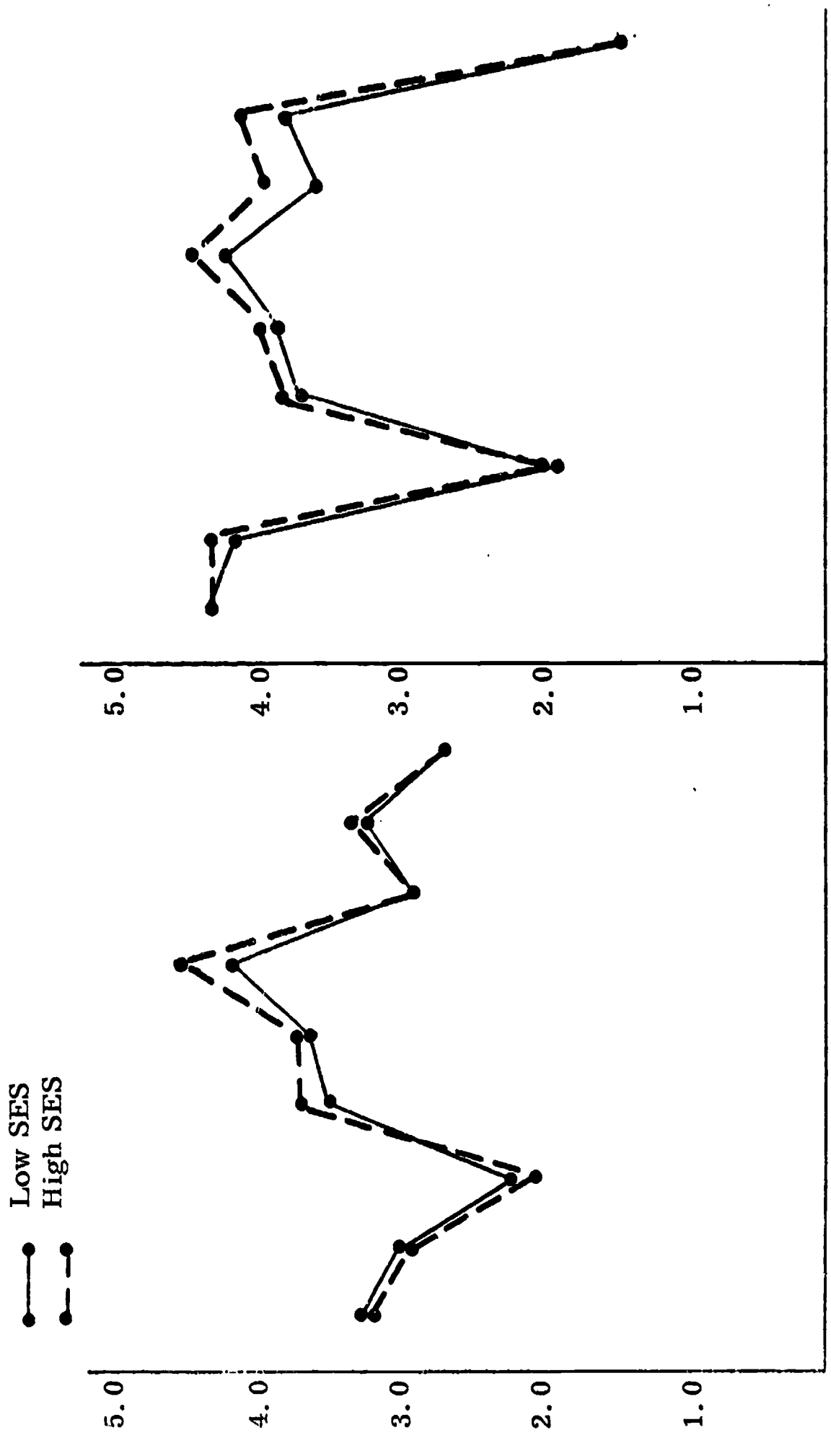
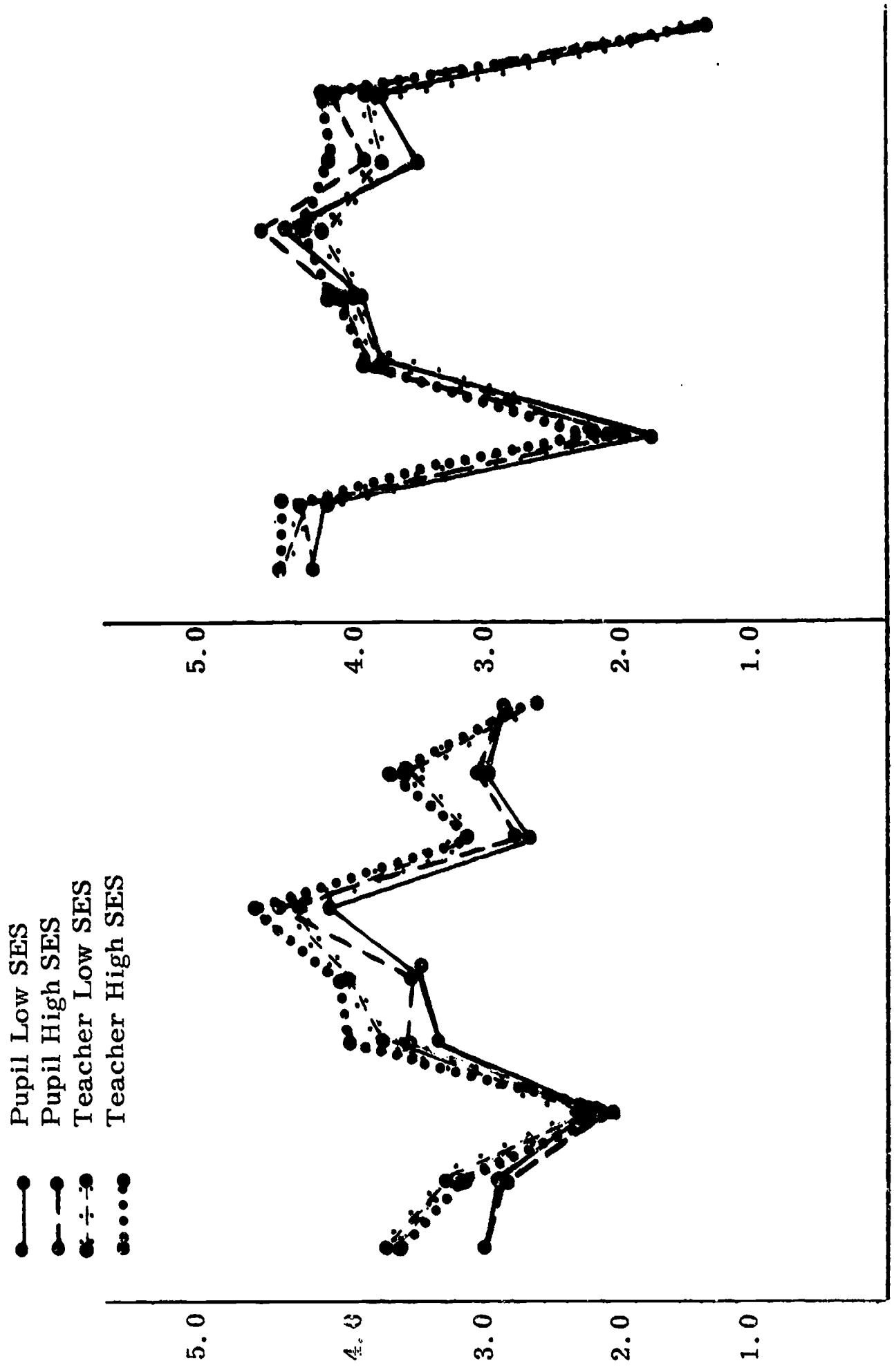

Pupils
Teachers
5.0
4.0
3.0
2.0
1.0
A FEAR
A DISG
A HAPY
A SURP
A SUFR
A ANGR
A CNTP
A DETR
A JOY
E FEAR
E DISG
E HAPY
E SURP
E SUFR
E ANGR
E CNTP
E DETR
E JOY
Estimated

Fig. 1--Status



Estimated --School

Fig. 2.--S



Estimated

Fig. 3.--Status x Sc

APPENDICES

TEACHER INFORMATION SHEETS

1. Name_____

2. Grade Level Taught
   - 4_____
   - 5_____
   - 6_____

3. Age
   - _____20-25
   - _____26-30
   - _____31-35
   - _____36-40
   - _____41-45
   - _____46-50
   - _____51-55
   - _____56-60
   - _____Over 60

4. Years Teaching Experience
   - _____1-4
   - _____5-10
   - _____11-15
   - _____16-20
   - _____20-25
   - _____Over 25

INSTRUCTIONS: YOU ARE ABOUT TO SEE A FILM WHICH HAS NO SOUND. THERE WILL BE A TEACHER WHO WILL BE DOING CERTAIN THINGS. PLEASE RATE THE MEANING OF EACH SECTION OF FILM WITH THE HELP OF THE WORDS GIVEN.

STUDENT INFORMATION SHEETS

1. Name_____

2. Grade 4_____
5_____
6_____

3. School_____

4. Teacher_____

5. Sex boy_____
girl_____

INSTRUCTIONS: YOU ARE ABOUT TO SEE A FILM WHICH HAS NO SOUND. THERE WILL BE A TEACHER WHO WILL BE DOING CERTAIN THINGS. PLEASE RATE THE MEANING OF EACH SECTION OF FILM WITH THE HELP OF THE WORDS GIVEN.

1. EXCITABLE	_____ _____ _____ _____ _____	CALM
2. PLEASANT	_____ _____ _____ _____ _____	NOT PLEASANT
3. STILL	_____ _____ _____ _____ _____	ACTIVE
4. NOT ANGRY	_____ _____ _____ _____ _____	ANGRY
5. NOT COMFORTABLE	_____ _____ _____ _____ _____	COMFORTAELE
6. GOOD	_____ _____ _____ _____ _____	BAD
7. UGLY	_____ _____ _____ _____ _____	BEAUTIFUL
8. HAPPY	_____ _____ _____ _____ _____	SAD
9. KIND	_____ _____ _____ _____ _____	CRUEL
10. DON'T LIKE	_____ _____ _____ _____ _____	LIKE
11. TENSE	_____ _____ _____ _____ _____	RELAXED

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