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ABSTRACT

This study investigated the effect of locale, grade, and subject on instructional quality. Rural and urban teachers were observed teaching grades 4, 5, and 6 in social studies, mathematics, and language arts. It was hypothesized that teacher verbal behavior in a classroom predicated the quality and quantity of cognitive behavior of pupils. Rural teachers were observed to produce more "seek" and significantly fewer "reject" verbalizations than the urban teachers; they provided more productive critical thinking on the part of their pupils and rejected few pupil utterances. The structure and nature of the curriculum seemed to determine, in part, the kind of verbal interaction that took place in the classroom. Mathematics teachers asked more questions and provided more corrective feedback than social studies teachers. Social studies teachers provided more information directly than did the mathematics teachers. Language arts teachers evoked from their pupils more independent thinking with less emphasis on acquiring specific knowledge of facts. A variation was observed in the verbal behavior of teachers dealing with pupils at different grade levels. The results of this study are discussed in terms of contemporary emphasis in preservice and inservice teacher training practices. (JD)

Instructional Quality as a Function of Locale, Grade, and Subject

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Instructional Quality as a Function of Locale, Grade, and Subject

The quality of instruction is an important area of concern of educators and educational researchers. The establishment and support of a number of centers/institutes for research on teaching in the U.S.A. and other countries bear witness to the recognition of need of research in this area. An implicit assumption underlying any research study in education is that it will provide additional knowledge of the behavior of instructionally relevant variables and that ultimately there will be pay off in improved teaching and learning. However, the teaching-learning system is very complex, dynamic, and interactive. After many years of research effort, only the surface of the system has been scratched.

What is quality teaching/instruction? There does appear to be general agreement that whatever it is, it is not a unidimensional attribute that can be readily measured. Keeping the nature of instructional system in mind it is clear that any effort to assess the quality of instruction should incorporate both the process and substance variables. A statement on the quality of instruction based on the observed magnitude of process and substance variables may meaningfully reflect its multidimensional variability. The present study has attempted to measure both process and substance variables and to explore the relationship among them and locale, grade, and subject of instruction.

Gage (1963), Flanders (1970), and Ryans (1960) have commented on the desirability of identifying and measuring kinds of teacher behaviors that differentiate teachers. Bloom (1964) and Walberg (1974) have made a strong case for process research/evaluation in education. Randhawa and Fu (1973) reviewed an extensive literature in the process research tradition and concluded that classroom learning climate is dependent on curriculum area, grade level, and locale. They observed as have Wlaberg (1974) and Yamamoto, Thomas, and Karns (1969) that students become overtly critical of their learning environment in higher grades, that pupils in rural areas endure inferior learning environments (Randhawa & Michayluk, 1975), and that curriculum contents dictated, to some extent, the pupil perception of the learning environment. Subject specific perceptions of cognitive classroom press produced significant discriminant functions that separated mathematics from language arts on the "convergence-divergence", language arts and mathematics from science and social studies on the "syntax-substance", and science from social studies on the "objectivity-subjectivity" dimension (Steele, Walberg, & House, 1974). However, Anderson (1971) obtained similar discriminant coordinates based on an instrument that tapped sociopsychological rather than cognitive classroom press.

Previous research involving sociopsychological and cognitive press variables has demonstrated specific differences in grades, locales, and curricula. It would follow that teacher behaviors depend on the grade level, locale, and the subject of instruction since a teacher exercises jurisdiction and control on a large number of the classroom activities. Gallagher (1970)

has demonstrated that teacher verbal behavior in a classroom predicated the quality and quantity of cognitive behavior of pupils. It was hypothesized that teacher verbal behavior would be a function of locale, grade, and curriculum content (subject area).

Method

Observation Instrument. The verbal behavior classification system (CVC) developed by the Cooperative Educational Research Laboratory, Inc. (1969) was used for data collection. The CVC system consists of a 4 x 4 matrix of process and substance dimensions. Categories in the process dimension are seek (S), inform (I), accept (A), and reject (R) and those in the substance dimension are cognition-memory (C), productive critical thinking (T), expressed emotion (E), and class management (M).

This instrument was selected because 1) it provided desired information on cognitive, affective, and management aspects of the classroom on its substance dimension; 2) its process dimension included categories shown to be important and significant from the previous research; 3) it is an observation system that represents a synthesis/modification of a number of well known systems (Simon & Boyer, 1970) which have been used extensively in research on teaching; and 4) it can be used for categorizing the verbal behaviors of teachers and their pupils if desired.

Training of Observers. The original CVC manual for training observers was expanded to include examples of the 16 cells of the matrix separately just before the section on combinations of process and substance categories. Also, verbal interaction simulations on videotape and script were prepared for use in the training workshop.

Three trainers and 24 potential observers took part in the training in the first week of October, 1975. Eight of the potential observers were guest participants from another province. The training workshop started at 9:00 a.m. on a Monday and ended at 4:00 p.m. on the following Friday.

The training consisted of instruction and study of the revised CVC manual, practice in recording observations using the simulated script and videotape, and also actual recording in the classrooms of a city elementary school. Training with the manual and simulated materials provided immediate corrective feedback and a group discussion on the observation process followed. By the end of the workshop the trainees had reached a proficiency level of at least 95% consistency. The sixteen provincial trainees selected amongst themselves twelve for participation as observers in the study. The remaining four were available as substitutes if needed but such a contingency never arose.

Data Collection. The Monday following the training workshop each observer started data collection in the classes assigned. Each selected teacher was observed only once each week but by different observers. The record of observations was prepared by an observer right from the beginning to the conclusion of the lesson. This was considered essential in the present study because the type and kind of interaction that takes place during different phases of a lesson varies. Each observer observed two or three lessons a day for a period of two weeks. An observer recorded by hand in the supplied forms the cell symbols of the CVC matrix and also tape recorded by hand in the supplied forms the cell symbols of the CVC matrix and also

tape recorded the verbal interaction in the specific classroom. Each audio tape was used for determining the reliability of the records and also to assure interobserver consistency.

The frequency of occurrence of each cell subcategory of the CVC matrix was obtained from each record and punched on an IBM card along with other relevant demographic data. These data were stored on a magnetic tape. For the purposes of the present study, the cell frequencies of the two records for a teacher (classroom) were combined and converted into percentages. This was necessary again because the time of observation was different for different classrooms and for two lessons of the same teacher in the same classroom.

Data Source. Data were collected in language arts, mathematics, science, and social studies classes of grades 4, 5, and 6 from a rural and an urban school jurisdiction. The cell frequencies in a fixed 2 x 4 x 3 cross factorial design are given in Table 1.

Insert Table 1 about here

Schools in the rural school district are located in towns with population range of approximately 200 - 600 and these schools serve children from surrounding farm families. The economy of most of these towns is largely farm based. One of the towns in this district has a potash mine in the area.

The urban school district is located in a city of about 40,000. The economy of this city is both farm- and industry-dependent.

Data Analysis. Data were analyzed using the exact least squares procedure for the multivariate and univariate analysis of variance (MANOVA) programmed by Finn (1972). Fifteen of the sixteen cell variables and three each of the process and substance marginals were analyzed in the MANOVA context in three separate runs. In each of these analyses one of the variables had to be dropped because of linear dependence (the sum of the variables in each set was 100). The dropped variables, reject management, management, and reject, were analyzed individually in the context of the design using ANOVA procedure. Post-hoc pairwise analysis for the subject and grade effects was done using orthogonal contrasts with 1 df.

The distribution of percentages indicated that in some cases transformations might be necessary to normalize the variables. Consequently, root and log transformations were applied to all the 16 dependent variables and the transformed data were analyzed in the context of the design for this study. The MANOVA and ANOVA results for the 16 cell variables were almost unchanged at the .05 level. However, the individual F-ratios and the corresponding confidence levels indicated some changes, but these were not discrepant enough to warrant a major change in interpretation from the raw percentages on these data.

Results and Discussion

Locale Effect. Combined means, mean squares, and univariate F-ratios for the locale main effect on all the 24 variables analyzed are given in

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Insert Table 2 about here

Table 2. Table 2 also provides within-variances (error term for the ANOVA) for the 2 x 4 x 3 design. Obviously, CVC cell, process and substance mean vectors are unequal for the rural and urban teachers as evidenced from the MANOVA results for each group of variables ($F(15,79) = 6.37$, $p < .0001$, $F(3,91) = 7.10$, $p < .0003$, and $F(3,91) = 4.97$, $p < .0031$ respectively). The univariate ANOVA results of the CVC cells indicate that the rural teachers had significantly fewer IC, more IT, and fewer RC and RM verbal utterances in their classrooms than the urban teachers. In the process domain the rural teachers produced significantly more seek and significantly fewer reject verbalizations than the urban teachers. Significantly fewer cognition memory and significantly more production critical thinking verbal utterances were obtained in the classrooms of rural teachers than the urban teachers.

What does all this mean? Can a statement on the inferred quality of instruction in the two locations be made? The answer to the second question is based on subjective judgement. However, in the face of the empirical data presented the subjectivity is reduced somewhat. An affirmative answer to the second question is proposed and it is concluded that the rural teachers, given all other factors that might be proposed to account for this, provided a better quality of instruction than the urban teachers. This conclusion is supported by the fact that the rural teachers provided more productive critical thinking type of information, asked more questions (seek) of their pupils and rejected fewer pupil utterances. Randhawa and Michayluk (1975) have provided some evidence that the significant underlying variables might be the general classroom environment, the group cohesiveness, and alienation,

evidence that is partly substantiated in the present study with the significant differences in the rural and urban teachers on the RM variable. Also, in the present study RM had significant ($p < .05$) within correlations of $-.32$ and $-.21$ with C and T respectively. Therefore, it is quite likely that urban teachers spend significantly more time in corrective disciplinary tasks which adversely affect cognitive and productive critical thinking tasks.

Subject Effect. The MANOVA subject main effect was significant ($F(45,235.5) = 1.63$, $p < .0110$) indicating that teachers engaged in different kinds of behavior depending on the subject of instruction. The MANOVA results on the process and substance variables indicated that only the process vectors on this factor differed significantly ($F(9,221.6) = 3.68$, $p < .0003$). The results of the univariate ANOVA on the cell, process, and substance variables, as shown in Table 3, indicated that the means of the teachers

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Insert Table 3 about here

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of the four subjects differed significantly only on SC, ST, AT, S, I, and T.

The tests of orthogonal contrasts within the subject factor indicated that social studies and mathematics teachers engaged in significantly different verbal utterances ($F(15,79) = 2.44$, $p < .0057$) and that the mathematics teachers had significantly higher frequency of SC and RC, and lower of IC than the social studies teachers. Again, the process mean vectors

for these teachers were unequal ($F(3,91) = 7.95$, $p < .0001$) with specific significant univariate mean differences on S and I. Mathematics teachers ask more questions and provide more corrective feedback (RC) than the social studies teachers. Social studies teachers, on the other hand, engage in providing more information directly (IC) than the mathematics teachers. Mathematics curriculum is more convergent than social studies because there is a higher probability of correct answer in mathematics.

Language arts and mathematics teachers differed in their overall behavior ($F(15,79) = 2.44$, $p < .0056$). Language arts teachers produced significantly fewer SC and significantly more ST and AT utterances. The process mean vectors for these two groups were unequal ($F(3,91) = 3.63$, $p < .0159$) such that the S mean for the mathematics teachers was significantly higher than the language arts teachers. These results are consistent with the "convergent-divergent" discriminant dimension obtained in a study involving students' perceptions of cognitive classroom press that separated mathematics from language arts classrooms (Steele, Walberg, & House, 1974). Mathematics curriculum is more convergent than language arts because there is a correct answer.

The structure and nature of the curriculum seem to determine, in part, the kind of verbal interaction that takes place in a classroom. Thus instructional behavior is subject specific. Differences in the reputations of teachers may, in part, be an artifact of their curriculum responsibility. This finding, though not unexpected, has implications for systems considering merit increases for teaching effectiveness and student ratings.

Grade Effect. The MANOVA tests of the grade main effect for the cells and substance variables were significant (F (30,158) = 1.75, $p < .0150$ and $F(6,182) = 2.50$, $p < .0240$). These results indicated that teachers exhibited different behaviors depending on the school grade they were teaching. Combined means, univariate mean squares and F-ratios for all the dependent variables on this factor are given in Table 4. These results

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Insert Table 4 about here

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show that the means of teachers of the three grades were unequal on SM, IC, IE, and E.

Tests of orthogonal contrasts on this factor indicated that the substance mean vectors of grades 4 and 5 teachers were unequal ($F(3,91) = 3.14$, $p < .0293$) such that the specific mean of grade 4 teachers was significantly greater than the grade 5 teachers on E. Similarly, the substance mean vectors of grades 4 and 6 teachers were unequal ($F(3,91) = 2.76$, $p < .0468$). Also, grade 4 teachers produced significantly more emotional (E) utterances which entailed expressions of empathy, sympathy, feelings, etc. than grade 6 teachers.

The cell mean vectors of grades 5 and 6 teachers were unequal ($F(15,79) = 1.88$, $p < .0377$). The only significant univariate contrasts were on SM and IC such that grade 5 teachers sought the assistance of their pupils in management related chores of the classroom more than grade 6 teachers and that grade 6 teachers engaged in providing more cognition-

memory type of information than grade 5 teachers. Walberg, House, and Steel (1973) concluded in a study of grades 6 - 12 involv[illegible] tions of cognition and affect that the lower level cognitiv[illegible] seen as more emphasized in the higher grades. Clearly this trend is established in grades 4 - 6 in the present study.

In spite of the statistically significant differences presented above, it is difficult to make a clear choice of teachers' group from different grades in terms of instructional quality. No differences were found on the process variables. Multivariate and univariate differences were found on cells and substance variables, but it is clear that the discriminating variables contain E among them. The frequency of occurrence of this group of variables (E) was less than 0.5% in any classroom observed in the present study. Therefore, this variable in itself is of little consequence in making comparisons on the quality of instruction. SM and IC showed significant differences in ANOVA for the grade factor. Consideration of these two cell variables together with the other 10 does not provide much choice among the teacher groups from grades 4 - 6.

General Discussion. The overall pattern of verbal utterances for all the 117 teachers involved in the present study on the marginal categories was: cognition memory = 56.06%, critical productive thinking = 1[illegible].34%, expressed emotion = .21%, management = 33.39%, seek = 26.40%, inform = 60.80%, accept = 10.22%, and reject = 2.58%. The overall frequency of expressed emotion was so low that is was almost non-existent as a significant interactional repertoire in many classrooms. Is it because feelings and emotions are not supposed to be discussed and talked about in public and that these

are considered to be private matters to be kept to oneself? Or is it that humans have the propensity to do only those things with ease in which they feel competent? In the case of teachers and perhaps parents and ordinary individuals in our society, as well, it may be due to both of the above reasons that feelings and emotions are avoided in professional as well as day to day interpersonal encounters. This finding was a surprise because in the past decade or so there has been a considerable emphasis on the affective domain and humanistic education in preservice and inservice teacher training in this particular province. The teacher education curricula in other provinces in Canada and in the U.S.A. also placed considerable emphasis on interpersonal relations and objectives in the affective domain in various curriculum areas. It will be interesting to determine the pattern of utterances of teachers in other regions. If these findings replicate the results of the present study then this issue should receive a serious consideration.

The pattern of teachers' verbal behavior in different locales, subject areas, and grades varies. The peaks and valleys in locales and subject areas are more pronounced than in the three grades. Instructional quality, in terms of verbal behaviors, seems to be dependent on the structure, organization, and nature of the curricular content; socio-cultural make-up of the classroom; and to some extent the developmental level of students. Also, teachers who spend more time in corrective and disciplinary chores obviously spend less time on cognitive and intellectual tasks and whatever time is spent on academic tasks most of that is utilized on cognition memory

type of activities. The concomittant effect of this should be a less exciting and inviting intellectual and emotional discourse.

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TABLE 1

Cell Frequencies

Locale	Grade		
	4	5	6
Rural			
Language Arts	5	5	5
Social Studies	4	5	4
Science	5	5	4
Mathematics	5	5	5
Urban			
Language Arts	5	7	4
Social Studies	6	5	6
Science	5	4	4
Mathematics	5	5	4

TABLE 2

Combined Means on the Locale Effect, Within-MS, Mean Squares, and Univariate F-Ratios for the Three Groups of Dependent Variables

Variable	Locale		ANOVA	Locale	
	Rural	Urban	Within-MS[a]	MS	F-Ratio
Cells					
1. Seek Cognition (SC)	19.10	16.84	41.57	150.02	3.61
2. Seek Thinking (ST)	4.85	3.94	21.09	24.27	1.15
3. Seek Emotion (SE	0.06	0.07	0.06	0.01	--
4. Seek Management (SM)	3.80	4.13	6.37	3.19	--
5. Inform Cognition (IC)	24.90	33.36	91.71	2091.30	22.80*
6. Inform Thinking (IT)	5.74	2.64	13.19	279.91	21.22*
7. Inform Emotion (IE)	0.11	0.16	0.03	0.09	2.72
8. Inform Management (IM)	29.08	25.61	141.30	351.78	2.49
9. Accept Cognition (AC)	7.77	7.36	16.01	4.48	--
10. Accept Thinking (AT)	1.69	1.27	2.64	5.24	1.98
11. Accept Emotion (AE)	0.01	0.01	0.002	--	--
12. Accept Management (AM)	1.25	1.09	2.50	0.78	--
13. Reject Cognition (RC)	1.14	1.64	1.00	7.28	7.26*
14. Reject Thinking (RT)	0.20	0.33	0.26	0.46	1.73
15. Reject Emotion (RE)	0.00	0.01	0.001	0.003	3.46
16. Reject Management (RM)	0.29	1.53	4.38	44.74	10.22*

TABLE 2

(continued)

Variable	Locale		ANOVA	Locale	
	Rural	Urban	Within-MS[a]	MS	F-Ratio
Process					
1. Seek (S)	27.81	24.99	51.38	233.98	4.55*
2. Inform (I)	59.83	61.78	107.06	111.35	1.04
3. Accept (A)	10.72	9.73	19.02	28.73	1.51
4. Reject (R)	1.64	3.51	6.10	102.39	16.79*
Substance					
1. Cognition (C)	52.92	59.20	165.32	1155.65	6.99*
2. Thinking (T)	12.49	8.19	77.90	541.40	6.95*
3. Emotion (E)	0.17	0.25	0.11	0.20	1.76
4. Management (M)	34.42	32.36	200.22	124.58	--

[a] $df = 93$

* $p < .05$

TABLE 3

Combined Means, Mean Squares, and Univariate F-Ratios of the Subject Effect for the Three Groups of Dependent Variables

Variable	Subject				MS	F-Ratio
	Language Arts	Social Studies	Science	Mathematics		
Cells						
1. SC	17.36	15.37	15.55	23.44	404.02	9.72*
2. ST	6.54	3.67	3.84	3.34	66.50	3.15*
3. SE	0.09	0.04	0.06	0.06	--	--
4. SM	3.44	3.94	3.85	4.69	8.24	1.29
5. IC	26.44	33.39	29.46	27.74	236.56	2.58
6. IT	4.69	3.86	4.61	3.44	10.66	--
7. IE	0.17	0.16	0.09	0.12	0.04	1.06
8. IM	27.33	27.56	29.86	24.64	130.00	--
9. AC	7.94	7.23	6.99	8.02	7.44	--
10. AT	2.47	1.17	1.30	0.90	14.69	5.56*
11. AE	0.02	0.02	0.00	0.00	--	--
12. AM	0.99	1.24	1.43	1.03	1.20	--
13. RC	1.38	1.22	1.28	1.72	1.66	1.66
14. RT	0.38	0.30	0.21	0.17	0.24	--
15. RE	0.00	0.00	0.01	0.01	--	--
16. RM	0.76	0.85	1.46	0.67	3.94	--

TABLE 3

(continued)

Variable	Subject				MS	F-Ratio
	Language Arts	Social Studies	Science	Mathematics		
Process						
1. S	27.43	23.02	23.31	31.53	453.27	8.82*
2. I	58.63	64.96	64.01	55.93	533.56	4.98*
3. A	11.42	9.66	9.73	9.95	20.90	1.10
4. R	2.52	2.37	2.96	2.58	2.74	--
Substance						
1. C	53.13	57.20	53.28	60.92	403.04	2.44
2. T	14.08	9.00	9.96	7.86	226.37	2.91*
3. E	0.28	0.22	0.16	0.19	--	--
4. M	32.51	33.58	36.60	31.03	154.57	--

*$p < .05$

TABLE 4

Combined Means, Mean Squares, and Univariate F-Ratios of the Grade Effect for the Three Groups of Dependent Variables

Variable	Grade			MS	F-Ratio
	4	5	6		
Cells					
1. SC	18.88	17.12	17.87	31.44	--
2. ST	4.98	3.84	4.25	13.48	--
3. SE	0.12	0.05	0.02	0.11	1.71
4. SM	3.41	4.84	3.62	23.76	3.73*
5. IC	26.89	27.36	33.73	544.16	5.93*
6. IT	4.22	3.83	4.56	5.18	--
7. IE	0.12	0.07	0.11	0.19	5.51*
8. IM	27.50	30.11	24.16	339.03	2.40
9. AC	8.22	7.70	6.64	24.08	1.50
10. AT	1.72	1.40	1.25	2.17	--
11. AE	0.02	0.01	0.00	--	1.66
12. AM	1.23	1.27	1.00	0.84	--
13. RC	1.49	1.34	1.35	0.28	--
14. RT	0.29	0.30	0.20	0.18	--
15. RE	0.00	0.01	0.01	--	--
16. RM	0.82	0.76	1.22	2.39	--

TABLE 4

(continued)

Variable	Grade 4	Grade 5	Grade 6	MS	F-Ratio
Process					
1. S	27.40	25.84	25.76	33.35	--
2. I	58.82	61.37	62.56	140.25	1.31
3. A	11.18	10.39	8.89	50.64	2.66
4. R	2.59	2.40	2.78	1.35	--
Substance					
1. C	55.48	53.51	59.60	364.61	2.21
2. T	11.20	9.37	10.26	33.98	--
3. E	0.35	0.14	0.14	0.58	5.03*
4. M	32.97	36.98	30.00	473.83	2.37

*$p < .05$